SCIENCE

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THE NEW YORK MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE meetings of the American Association for the Advancement of Science and of the national scientific societies affiliated with it, held during convocation week, demonstrate a further advance in the organization of science in this country. The number of scientific men gathered together was larger than ever before in America or in any country except Germany, and still more significant is the fact that there were manifest on all sides devotion to high ideals of scientific research and a spirit of sincere cooperation. It is a fine thing that in a country and period supposed to be concerned chiefly with material success there should come together more than two thousand scientific men and women, nearly all of whom have chosen and now pursue their life work from love of science and of truth, who are devoting themselves to the increase of knowledge and the application of this knowledge to human welfare.

There are, of course, difficulties as well as advantages in a meeting of such magni-

tude. At the first of the convocation-week meetings, held in Washington four years ago, there was some conflict of interests; for example, three sessions devoted to the reading of botanical papers were held simultaneously. At the second large meeting, held in Philadelphia two years ago, the friction was slight, but questions as to the advisability of such joint meetings and of the usefulness of the American Association were occasionally raised. At the present meeting the general spirit of harmony and good fellowship was obvious. There are, of course, many open questions and many differences of opinion—it would be a sign of atrophy rather than of growth if such did not exist—but everywhere appeared a willingness to solve the questions and compromise the differences by the use of kindliness and common sense.

It was indeed a cause of regret that it was possible to attend only one of the simultaneous meetings and to talk at leisure with only a small part of those present, but this is a drawback which evidently would not be overcome if the societies met simultaneously in a dozen different places. The specialization demanded by the increase of knowledge and the limits of the capacity of a single man does not set sharp boundaries between the sciences, but rather tends to obliterate them. A society of physiological chemists can not meet apart from physiologists and chemists, or a society of vertebrate paleontologists apart from geologists and zoologists. There were held in New York joint meetings of special interest of botanists and zoologists, of mathematicians and astronomers, of philosophers and psychologists, and of other groups. The opportunity was also taken for the meetings of many committees and boards, on which men of science working in different directions are represented.

There was in no case any conflict between a section of the association and a special society; in all cases joint programs were arranged. It was indeed suggested in the council that the officers of the sections and the sections themselves are superfluous, but this probably represents the opinion of a small minority. The special societies are far more competent than the sections to arrange special programs and to elect their members. The association has acknowledged this, its council having passed resolutions empowering the sectional committees to turn over special papers to the special societies and instructing the permanent secretary to nominate as fellows members of the affiliated societies having the same standards as the association. But the sections still have important functions. They give an organization which provides for representation in the council and for reference from the council of special questions. The sections, as a rule, embrace a group of sciences, and thus serve as centers of affiliation and organization. They are also the best means of keeping the association and the sciences in touch with the wider public. A program such as that of the section of physiology and experimental medicine appears to be in every way satisfactory. It had a vice-presidential address of general interest and a discussion on a subject common to the sciences concerned, but left all special papers to the societies meeting in affiliation.

The wide dispersal of American men of science and the time of meeting are more serious difficulties than the unification of interests at the meetings. The solution will probably be found in meetings at more than one time in the year and at more than one place. The association held this summer a most pleasant and profitable meeting at Ithaca; it has authorized those sections which so desire to hold meetings during the summer of 1907, and plans a general summer meeting in some New England town in the summer of 1908. Two meetings a year will partly solve the difficulties of travel, for one of them would naturally be held near the Atlantic seaboard and one farther to the west. Still, the time will probably come when it will be desirable to hold two or more meetings simultaneously in different regions, having perhaps a general congress of scientific men once in three or five years.

The association should be competent to make the arrangements whenever and wherever meetings of scientific men are needed. There are many details, such as railway transportation, which can be most economically arranged at a central office, and there should be in each center academies, societies or committees which stand in relation to the association. The Smithsonian Institution or the Carnegie Institution should provide a central office for the association, and if neither of these institutions appreciates the privilege of doing this, funds should be secured for a building. The council at New York passed an important resolution instructing the committee on policy to report means by which "the efficiency of the organization of the association may be increased and the office of the permanent secretary made more important." There is every reason to believe that the secretary of the association should and will occupy an office at least equal in usefulness, dignity and salary to the secretaryship of the Smithsonian Institution. In this age and country it is a higher honor to be directly responsible to the organized body of American men of science than to be subject to a board of regents or trustees, the majority of whom have but a vague conception of the methods and ideals of science.

The general secretary, in his report of the meeting printed below, estimates the attendance at *not less than* 1,500. This is a safe estimate, for he tells us that while 106 members of Section C registered, the attendance of chemists was estimated at 300. In so far as similar conditions hold for other sections, this would indicate a total attendance of about 2,700 scientific men and women, and this figure would not include the large number of local members who attended some of the functions or sessions without registering or the ladies who accompanied members. This may be an overestimate, but certainly the lecture rooms of Columbia University were as a rule crowded. Thus on Friday afternoon people were standing and turned away from the discussion before the naturalists on 'The Biological Significance and Control of Sex' and the address by Professor William James on 'Surplus Stores of Energy.' Yet each of the lecture rooms holds about 300, and there were many other meetings at the same time. There were about 2,000 people at the exercises at

the American Museum of Natural History on Saturday.

To ascertain the exact attendance at the meetings is not in itself a matter of importance. A great many members of the association do not register because there is no reason to do so except as a matter of record. It is, however, unfortunate that such a large proportion of scientific men attending the meetings are not members of the association. There has indeed been a great improvement in recent years, the membership having increased about threefold since the preceding New York meeting of 1900. At that time the official membership was 1,721, whereas on December 1 it was 4,498, and over 400 new members were added at the meeting. This increase is largely due to the fact that at the preceding New York meeting arrangements were made by which this journal is sent free of charge to members without any advance in the membership fee. For the sum of three dollars an American scientific man may be a member of the association and receive the weekly issues of SCIENCE, whereas in Great Britain it costs $12.50 to belong to the British Association and to receive *Nature*. Yet the purchasing power of money is greater there than here. A committee on increase of membership was established by the council, and it is to be hoped that this committee will bring to the attention of all men of science the privilege and the duty of allying themselves with their fellow workers in our national scientific organization.

The most unsatisfactory aspect of recent meetings of the association has been the lack of adequate recognition and appreciation by the general public. In a democracy, science, literature and art should not depend on patrons and privileged classes for support and recruits, but on the whole people. The American Association is now accomplishing more than the British Association in its work as a body of scientific men, but it falls far behind it in a function nearly as important, namely, the diffusion of science and the promotion of general appreciation of scientific work. At the annual meetings of the British Association from one to two thousand associates and ladies, the leading people of the community, join the association, subscribing to its funds and attending its meetings. The London *Times* and other newspapers devote daily pages to accurate reports. At and before the New York meeting about 500 leading citizens of New York City joined the association, including our greatest living man of letters, many of the prominent editors, lawyers, physicians and clergymen of the city, and a number of those prominent in the commercial development of the city and the county. This is a distinct advantage both for them and for the association, and similar and increased efforts in this direction should be made at subsequent meetings.

On the other hand, the reports in the press were simply scandalous, in spite of the fact that the editor of each of the leading papers consented at the request of a personal acquaintance to arrange for adequate reports. Because one of the speakers mentioned the name of Mr. John D. Rockefeller, three fourths of the space given to the whole meeting on that day with its two or three hundred important papers, was

devoted to him. The *Sun* reported in detail the alleged discovery of a method to do away with old age and death, cabled from France, while almost ignoring the scientific discoveries and advances of the meeting. A newspaper which would discharge an editor for making a 'break' in literature or art will expose its scientific nakedness without shame. But it must be remembered that it is our scientific men and our scientific organizations, rather than the newspapers themselves, on which the ultimate responsibility rests.

The principal events of the meeting are briefly recorded in the report of the general secretary, which follows, and accounts of the scientific sessions will be printed in subsequent issues. Probably the most important action taken was the establishment of a section on education. An amendment to the constitution to this effect had been proposed at the New Orleans meeting and was supported by a petition signed by 171 of those interested, including many leading educators. Such a section will have two somewhat distinct functions. It will be concerned, on the one hand, with education as a science and, on the other, with the teaching of the sciences. In both cases the alliance with the association is fortunate. Those who are aiming to make education a science can profit by association with those who are following sciences that are more exact, while a majority of the fellows of the association are engaged in teaching. There are also important questions of educational administration which can properly be brought before the section. Lastly, it is desirable on both sides that those who are engaged in the teaching of the sciences in the schools and colleges should be brought in contact with those who are carrying on research work. It may further be noted that steps were taken at the New York meeting to form a federation of the local societies of teachers of the mathematical and natural sciences. The constitution of the association was also amended so that psychology should be officially recognized in its scope. The Psychological Association, one of the strongest of our special societies, has long been affiliated with the association, and to it will doubtless be left the psychological program of the section of anthropology and psychology.

New committees were formed on seismology, on the bibliography of science and on the celebration of the fiftieth anniversary of the publication of the 'Origin of Species' in 1909. In that year the British Association will meet in Canada, and a cordial invitation was presented to take part in that meeting. A letter was read announcing that the Walter Reed memorial fund, the movement for which originated at the Washington meeting, now amounts to over $24,000, and toward completing the fund of $25,000, the sum of $100 was appropriated from funds in the hands of the permanent secretary, as a mark of appreciation by the association of Reed's great services in the suppression of yellow fever. A resolution was passed urging the passage of bills creating forest reserves in the Appalachians and the White Mountains.

Space permits no reference here to the scientific meetings, before which about 800 papers were presented, but these will be subsequently reported. A few words

should be said of the general functions and arrangements. It was recognized by all that Columbia University offered admirable headquarters. Earl Hall not only supplied good facilities for registration, but also provided excellent offices and rooms for writing, conversation and smoking. These were increased by the opening of the adjacent Faculty Club, where two smokers were held. The restaurant charges in the university commons were low and the service as good as could be expected for such large numbers. The rooms for the special meetings were often taxed to their full capacity, but were usually adequate, and there was practically no confusion or conflict. Equally satisfactory were the arrangements at the College of Physicians and Surgeons, which is the medical school of Columbia University, the University and Bellevue Hospital Medical College, which is the medical school of New York University, the Rockefeller Institute, the New York Botanical Garden and the American Museum of Natural History.

Especially to be noted as bringing together large groups of members were the reception given by the president of Columbia University in Earl Hall following the address of the retiring president of the association; the luncheon at the City College, preceded by timely addresses and followed by an inspection of the beautiful and well-arranged new buildings; the extremely interesting ceremonies connected with the unveiling of ten busts of pioneers of American science, presented to the American Museum by Mr. Morris K. Jesup, and the reception at the museum in the evening, given jointly by the museum and the New York Academy of Sciences, with an admirable exhibit of scientific progress arranged by the academy. Nearly every society and group of scientific men had their own smokers and dinners, so that in spite of the large numbers present, there was opportunity for each one to see those who work in his own field. The arrangements of the meeting prove that while the winter may not be so convenient as the summer in giving opportunities for informal metings and social intercourse, much can be accomplished in this direction.

The long line of great men who have filled the presidency of the association was at the New York meeting continued by a president who in rare degree unites dignity, tact and good sense, whose ideas and fit words come directly from broad sympathies and noble achievement. He is able to hand on the office to one eminent in his science, a leader in all movements to advance science and to promote the objects of the association from within and from without. The place of meeting is also fortunate. It will have been forty years since the association last met at Chicago, and in that period the city and the state have become notable for scientific activity. Chicago is nearer to the center of scientific population than New York, and there is every reason to believe that the meeting next year in that city will rival or excel the great New York meeting.

REPORT OF THE GENERAL SECRETARY

The fifty-seventh meeting of the American Association for the Advancement of Science was held at Columbia University,

New York City, December 27, 1906, to January 2, 1907.

The registered attendance of association members was 934. This places the meeting as the fifth in order of size. It was exceeded in attendance by the meetings at Philadelphia in 1884 (attendance 1,261), Boston in 1880 (997), Washington in 1902–3 (975) and Montreal in 1882 (937).

The average attendance at the last twenty meetings of the association preceding the New York meeting was only 458, about one half as great as at the New York meeting.

The above figures are from the registration at the central registration office up to five o'clock on December 31. The registration of attendance of three sections of the association was known to be incomplete at that time on account of an accident which interfered with the arrangements for registration. It is believed that the total number of persons in attendance at the meetings of the association and affiliated societies was not less than 1,500, placing it first in rank among meetings of the association.

The following shows the registered attendance by sections: A—Mathematics and Astronomy, 80; B—Physics, 104; C—Chemistry, 106; D—Mechanical Science and Engineering, 25; E—Geology and Geography, 115; F—Zoology, 181; G—Botany, 139; H—Anthropology, 57; I—Social and Economic Science, 24; K—Physiology and Experimental Medicine, 61; no preference indicated, 42.

The geographical distribution of the 934 members who registered is as follows: 300 from New York; 110 from the District of Columbia; 96 from Massachusetts; 82 from Pennsylvania; 44 from New Jersey; 44 from Ohio; 30 from Connecticut; 25 from Illinois; 17 from Rhode Island; 17 from Canada; 14 from Maryland; 14 from New Hampshire; 12 from Michigan; 11 from Virginia; 11 from Missouri; 10 from Wisconsin; and less than ten from each of twenty-four different states. Two persons registered from England and one each from Ireland, Cuba and Japan.

Four hundred and eleven new members were added to the association at this meeting. Of these about 350 are due to the activity of the local committee, which had, moreover, previously sent nominations in of about 125 members.

Ten papers were furnished to Section A. These papers were presented before the one joint session with the Mathematical Society and the Astronomical Society or were merged in their programs.

Section B had ten papers on its program, and the American Physical Society had 27 papers. The papers were presented in joint sessions.

Section C met in joint session with the American Chemical Society, at which 123 papers were presented. The large number of papers required that the section be divided into sub-sections of inorganic, organic, industrial, agricultural and sanitary, physical and biological chemistry, each presided over by a special chairman who added to the interest of the meeting by an address on his special branch of chemistry. Although the registered attendance of Section C was but little more than 100, the secretary of that section states his belief that about 300 chemists were present at the meetings.

Nine papers were presented before Section D (Engineering).

Section E held two independent sessions for the reading of papers; it also held four joint sessions with the Geological Society of America, the sessions being held in two sub-sections. Ten papers were presented to the section, and more than sixty papers were presented to the Geological Society.

Section F held joint sessions for the reading of papers with the American Society of Zoologists, at which about eighty

papers were presented. There was also held a joint session with Section G for the reading of papers on plant and animal breeding. The secretary of the section says that the attendance at the meetings was from 100 to 300.

Section G held three independent sessions for the reading of papers. About thirty papers were presented. Members of the section also took part in one joint session with Section F, and attended largely the meetings of the Botanical Society of America, one of which was held at the Botanical Garden in Bronx Park.

The program of Section H and its two affiliated societies contained forty-nine papers.

The programs of Section I, including the joint session with the Anthropological Association and Section H, contained eighteen papers.

Section K, together with its affiliated societies, held four sessions.

Much more than one half of the papers of the meeting belonged to the affiliated societies rather than to sections of the association. From this point of view the meeting was a confederation of affiliated societies to a greater extent than it was a meeting of a group of sections of a compact organization.

The subject of the address of the retiring president of the association, Professor C. M. Woodward, was 'The Science of Education.' A vice-presidential address was delivered before each section.

The relations between the sections and the affiliated societies were entirely harmonious, the officers cooperating with each other in making arrangements for meetings.

Columbia University placed its buildings at the disposal of the association and the greater number of sections met at the university. Certain meetings were held elsewhere, notably, the meetings of Section K at the Rockefeller Institute and at the College of Physicians and Surgeons. Appropriate thanks were tendered by the president of the association at the closing general sessions to the local committee, the authorities of Columbia University and to many others who, in their capacities as hosts, contributed to the success of the meeting.

The following general events contributed to the success of the meeting and the pleasure of those in attendance: (1) a reception by the president of Columbia University at Earl Hall on Thursday evening; (2) a general meeting with addresses and luncheon at the College of the City of New York at noon on Saturday; (3) on Saturday afternoon exercises at the American Museum of Natural History, connected with the unveiling of the busts of ten American men of science, presented to the museum by Mr. Morris K. Jesup; (4) on Saturday evening a gathering at the museum to see the collections and special exhibits arranged for the occasion. The cultivation of acquaintance among the members was also promoted by many smokers, dinners and other special events which brought various groups together. The reception at Earl Hall on Thursday evening was probably the only occasion at which one found so large a gathering of members at any one place as to give the idea that this meeting of the association was an unusually large one. Probably most members did not realize that they were attending one of the largest if not the largest meeting of many years.

The most important actions taken by the council and the association were as follows:

1. The addition of a new section to the association, namely, Section L—Education. A petition in favor of the formation of such a section was presented to the association to which were affixed the signatures

of 171 men, including many of the most prominent educators.

2. The title of Section H was changed from 'Anthropology' to 'Anthropology and Psychology.'

3. The permanent secretary was authorized to publish hereafter the programs of the affiliated societies as a part of the official program of the association.

4. Section E, and other sections desiring to do so were authorized to hold meetings in the summer of 1907.

5. A standing committee of fifteen on seismology was appointed. The committee consists of G. K. Gilbert, U. S. Geological Survey; Cleveland Abbe, U. S. Weather Bureau; L. A. Bauer, Carnegie Institution; C. E. Dutton. U. S. Army; H. F. Reid, Johns Hopkins University; Otto Klotz, Observatory, Ottawa, Ont.; W. W. Campbell, Lick Observatory; A. C. Lawson, chairman, California State Earthquake Commission; R. S. Tarr, Cornell University; L. M. Hoskins, Stanford University; C. G. Rockwood, Jr., Princeton University; W. H. Hobbs, University of Michigan; W J McGee, St. Louis; John F. Hayford, U. S. Coast and Geodetic Survey; and T. A. Jaggar, Jr., Harvard University.

6. A standing committee of five on the bibliography of science was appointed, one of whose duties shall be to cooperate with the International Catalogue of Scientific Literature. The committee consists of J. McKeen Cattell, R. S. Woodward, Jas. Lewis Howe, Wm. Trelease and C. B. Davenport.

7. A Darwin Memorial Committee of ten was appointed to consider the manner in which the American Association for the Advancement of Science may suitably commemorate the fiftieth anniversary of the publication of the first edition of the 'Origin of Species.' The committee consists of H. F. Osborn, chairman, L. O. Howard, E. G. Conklin, A. C. Lane, D. T. MacDougal, J. McK. Cattell, J. M. Coulter, H. B. Ward, F. Boas and C. B. Davenport, secretary.

8. Grants for research were made as follows: $100 to the Concilium Bibliographicum; $100 to Professor Frederick E. Clements for aid in the study of the relation of Alpine plants to their environment; $100 to J. Arthur Harris for aid to complete a statistical investigation of the influence of environment on the characteristics of organisms. The last two recommendations were made on the understanding that the grants will be expended under the supervision of the standing committee on the relations of plants to climate.

9. The Entomological Society of America was admitted to the privileges of affiliation.

10. The council recommended that the committee on the policy of the association be requested to consider means by which the efficiency of the organization of the association may be increased and the office of the permanent secretary be made more important, and that the consideration of these matters be made to include the following points: procuring a permanent secretary to devote his entire time to the work of the association and to receive greatly increased pay; the matter of raising the dues of the association; the matter of dropping the entrance fee of the association; the matter of changing the time of convocation week and of the meeting of the association; and the relation of the association to the affiliated societies.

11. It was decided to hold the next regular meeting of the American Association for the Advancement of Science, at Chicago in the winter of 1907–8, and not to hold a summer meeting in 1907.

12. It was recommended to the next general committee that a meeting be held in the summer of 1908, preferably in some New England town, and that the regular

meeting during convocation week in 1908–9 be held in Baltimore.

The officers elected for the ensuing year were:

President—Professor E. L. Nichols, Cornell University.

General Secretary—President F. W. McNair, Michigan School of Mines.

Secretary of the Council—Professor Wm. Harper Davis, Lehigh University.

Vice-presidents of the Sections:

A—Professor E. O. Lovett, Princeton University.

B—Professor Dayton C. Miller, Case School of Applied Science.

C—Professor H. P. Talbot, Massachusetts Institute of Technology.

D—Professor Olin H. Landreth, Union College.

E—Professor J. P. Iddings, Chicago University.

F—Professor E. B. Wilson, Columbia University.

G—Professor C. E. Bessey, University of Nebraska.

H—Professor Franz Boaz, Columbia University.

I—Dr. John Franklin Crowell, New York City.

K—Dr. Ludvig Hektoen, Chicago University.

L—Hon. Elmer E. Brown, U. S. Commissioner of Education.

Secretary of Section B—Professor A. D. Cole, Ohio University, for five years.

Secretary of Section I—Professor J. P. Norton, Yale University, for five years.

Secretary of Section L—Professor Edwin G. Dexter, University of Illinois, tor five years.

The Sectional Committee of the New Section, 'L' (Education)—President, David Starr Jordan, Leland Stanford University; President Charles S. Howe, Case School of Applied Science; Professor Thomas M. Balliet, New York University; Professor E. L. Thorndike, Columbia University; Professor C. M. Woodward, Washington University.

The minutes of the opening general session in Earl Hall on December 27, together with the addresses, are appended to this report.

JOHN F. HAYFORD,
General Secretary

PROCEEDINGS OF THE OPENING SESSION

PRESIDENT C. M. WOODWARD IN THE CHAIR

PROFESSOR WOODWARD: The American Association for the Advancement of Science will please come to order. In opening this meeting, ladies and gentlemen, and before I perform my simple official duty of introducing the new president, I can not avoid saying what a joy it is, what a delight it is, to meet such a congregation of scientific men. As one looks down the fifty-nine years which this association has lived and has seen how from a few hundred it has grown to four thousand members, and how many splendid things it has performed in one way or another all in the interests of science and making that science meet the needs of man in this great community, it is a time for congratulation; and I feel especially proud to be for the moment a representative of such an organization. And with this word of greeting to you and of congratulation for the association, I take great pleasure in presenting to you the president-elect, who will preside over our deliberations and lead us forward during the few days that we now meet together, Doctor W. H. Welch, of the Johns Hopkins University, who is to be president for the coming year—Doctor Welch.

DOCTOR WELCH: *Ladies and gentlemen,* this is not the first meeting of the association over which I have had the honor to preside, inasmuch as the old custom of holding a midsummer meeting was revived last summer. Before this larger gathering of the association I desire to renew the expression of my thanks and of my profound appreciation of the honor conferred upon me by election to this high office. I interpret this honor above all as a recognition of the position held to-day by medicine in its relations to general science, and it is especially as an honor conferred upon the science of medicine that I beg to acknowledge your action in selecting me to preside

over this association of scientific men and women.

We shall now have the pleasure of listening to words of welcome from the president of Columbia University, Dr. Butler.

PRESIDENT BUTLER: *Mr. President, ladies and gentlemen:* It is a pleasure, and no small satisfaction, speaking on behalf of my colleagues in the university—trustees, faculties, alumni and students—to offer you a cordial and hearty welcome to our home. Nowhere in America, perhaps, could you by any possibility receive a warmer or more sympathetic welcome than here. We are so fortunate as to count among our university membership a very considerable proportion of the membership of your association, and we look to them to lead and to guide and organize our university policies and opinions in the field of the sciences of nature and of man. Whatever facilities we may have for making you comfortable and happy are wholly and entirely at your service, and our part will be played to our own satisfaction if, when the hour of adjournment comes, you shall feel that nothing has been left undone that thought or care could do to provide in every way for the success of this gathering and for this most important meeting.

I might perhaps stop here, because, after all, there is not much to be gained by repeating a formal invitation that is once given with sincerity and heartiness; but I can not resist the opportunity to say just a word in addition to my word of welcome. I am one of those who now for nearly thirty years has observed at first hand the slow, and then the rapid, advance of the sciences to their present place in the school and college programs of this country. It has been my fortune to listen to and sometimes to participate in the discussions and debates which have accompanied that advance. So far as I now recollect, every vote that I have had to give has been given in its favor. But now at the end of this period I can not help feeling, as I observe from reading the literature of the subject that the same feeling is shown in England, in France and in Germany, that we have not yet succeeded in so organizing the sciences as instruments of general education as to fulfil the high expectations which some of us formed for them nearly a quarter of a century ago.

This is a subject which I respectfully commend to the study of this most representative and competent body. What is it that remains to be done, and what should we here do, so to correlate and organize and present the subject matter and the methods of the sciences as to increase their effectiveness as educational instruments?

I say with great frankness that if we did not know that we are going through what is doubtless a period of transition, the movement in which we have all been participating has cost us something and gained not much. But we are going through a period of transition. Perhaps we are expecting too much and too soon, but my purpose in saying what I now say is to bring to your attention the fact that to many of us the consideration of the educational effectiveness of the sciences touches the whole field of human interest, of human knowledge and of human activity.

There can be little doubt that the sciences of nature and of man, properly organized and presented as educational instruments, are destined to be classified as true humanities. I can not help feeling that in addition to their power to instruct and inform they have a power to refine, to uplift and to guide; but I am quite confident that as yet we are very far short of having so organized this material as to attain these ends.

I hope very much that the next decade may see intensive study of this aspect of these scientific problems and of scientific work; and that out of it all may come, not a larger place in the educational program

for the sciences, because that would hardly be possible—but a more effective and more uplifting and a more humanizing result of teaching the sciences, in order that we may pass on to the next generation this new educational instrumentality organized and perfected for true educational work, which never can be limited to the passing of information from hand to hand or mere instruction in method by master to pupil.

I throw out this suggestion, because here, in this association, are men and women devoting their lives to the study and investigation and presentation of truth, to whom in the colleges and universities, and to whom in the nation at large, we must look for the formulation of the answer to just such questions as this. To them I commend the question as to the proper organization of the sciences as instrumentalities in general education.

I say again you are heartily and completely welcome to this university and whatever hospitality it can offer and every act of friendliness which you will give us the privilege to show.

President Welch responded to the address of welcome as follows:

Ladies and Gentlemen: In behalf of the members of the American Association for the Advancement of Science and of the Affiliated Societies I thank you heartily, President Butler, for your cordial words of welcome, and I assure you and your colleagues that it is most gratifying to us to have the opportunity of meeting in this city and at this university.

It was not until nearly forty years after its foundation that this association met first in the city of New York, whereas this third meeting in New York follows only six years after the preceding one in the same place. These events in their periods of sequence indicate in a measure the rate of growth of science in this city and its increase of attractiveness to men of science. While for a century and more there have been eminent scientific men in New York City, it is, nevertheless, true that for a long period of time letters and science were not represented in this city in a degree at all commensurate with its position in other respects, and New York thereby lacked a note of distinction in its civic and educational life possessed by several smaller cities and even small towns in this country.

In recent years, indeed in the short interval since our last meeting here, the conditions have changed rapidly, and New York is taking a position in education and the promotion of science more nearly approaching its leadership in commerce and other material interests. The most powerful instrumentality in bringing about this great advance has been Columbia University with the influences which have gathered about it, and it is most gratifying to the members of this association to witness, where we are now assembled, the marvelous growth of this great university. A worthy share in this development of the higher learning has been borne also by New York University, and in our visit to the new buildings of the College of the City of New York, where a general meeting of the association is to be held on Saturday, we shall have the opportunity to behold the visible evidences of the most enlightened liberality of a municipality in support of higher education for the people.

Those interested in natural science will find nowhere a more impressive illustration of municipal liberality in support of an institution for the instruction of the people and the advancement of natural knowledge than the American Museum of Natural History, where on Saturday evening we are to be the guests of the trustees of the museum and of the council of the New York Academy of Sciences, this latter organization ranking also among the important forces contributing to the development of

science and of the scientific spirit in this city, and adding much to the interest of our meeting by the admirable exhibition and demonstrations of recent scientific progress which it has arranged in the museum. No feature of our meeting will afford greater pleasure and inspiration than the ceremonies attending the unveiling of the busts of American men of science presented to the museum by Mr. Morris K. Jesup, to whose generosity, public spirit and individual efforts American science is so deeply indebted. I wish to acknowledge at this time the courteous thoughtfulness of the trustees of the museum not only for their hospitality but also for selecting the time of our meeting for these interesting ceremonies.

The Metropolitan Museum of Art, with its magnificent collections in art and archeology, like the American Museum of Natural History, sets an example to the national government in the cultivation of the sciences and the fine arts.

Our botanical members at their meeting at the New York Botanical Garden will find there, as well as in the adjacent Zoological Park, in the opportunities afforded for the study of science and for the delight of the people, another and kindred illustration of the wise liberality of this city.

The New York Public Library, with its magnificent new building approaching completion, is another splendid foundation, resting upon both private and public munificence, which ranks among the great educational institutions of this city, whose growth and widened usefulness in recent years are significant of the progress of learning and science.

The holding of meetings of one of our sections and of affiliated societies in the new building of the Rockefeller Institute for Medical Research will afford opportunities to inspect laboratories unsurpassed in their arrangement and equipment for investigation in those branches of medical science to which they are devoted. In this connection I may state that New York City leads the world in the application by its department of health of the great discoveries of the last quarter of a century in bacteriology to the prevention of disease.

Time forbids further illustration of recent scientific progress in New York City. I have cited as examples mainly institutions with which the association will be brought, during our meeting, into some personal contact through their hospitality, and they will suffice to demonstrate the rapid and most gratifying development of higher education and of interest in the sciences of man and of nature in this city.

President Butler in his opening remarks has touched upon a subject most timely and important for the consideration of such men and women as constitute the membership of this association, and we shall do well to ponder carefully words on this theme coming from so high an authority upon education. While expressing sympathy with the aims of the natural and physical sciences, recognizing their importance and supporting them, as he has done, he also expresses the opinion that science in the general scheme of education and as an educational instrument has not fulfilled the expectations which he and others entertained regarding it a quarter of a century ago. While it is not possible to discuss this subject adequately on this occasion, I may be permitted to say a few words regarding it.

It is doubtless true that during the relatively short time since the natural sciences were admitted to the curriculum of a liberal education the teaching of these sciences has not attained to that agreement of opinion and fixity of method which centuries of use as instruments of education have secured for the classical languages and mathematics. It must be admitted that methods of teach-

ing the natural sciences have often been unsatisfactory and have, therefore, yielded unsatisfactory results. The subject is one for serious consideration, to which many of our teachers are, I think, alive, and it is a satisfaction to announce that the council at its meeting this morning, in response to a wide-spread and influential demand, recommended the formation of a new section of this association to be called the 'section on education,' which, we may hope, will contribute to the best methods of teaching the sciences.

It may also be admitted that exaggerated claims have sometimes been made as regards the position which the natural sciences should hold in the scheme of general education and as regards the extent and kind of mental discipline, culture and knowledge which, when pursued in such a scheme, they are capable of imparting. Without attempting to assign to these sciences their exact share in a plan of liberal education, and this share, I need hardly say, I deem an important one, I should be sorry to see eliminated from the education of even those looking forward to scientific pursuits the study of the languages, history and philosophy, which give a culture not to be derived solely from the study of the natural sciences and which should add greatly to the intellectual pleasure, satisfaction, breadth of vision and even efficiency of the man of science. Natural science should take its place in a plan of liberal education by the side of the older learning, the so-called humanities; each affords a kind of culture not to be obtained from the other, and any scheme of higher education which does not recognize the equal value of both kinds of culture is one-sided.

The full recognition of the part thus assigned to natural science in liberal education requires an adjustment on the part of the exclusive advocates of the traditional system handed down from the middle ages to new ideals of what constitutes liberal training, but in this field science has won its victory and will not be dislodged. It is, however, not enough to be content with this victory. Science should see to it that in its own field it becomes an instrument of education certainly not less powerful than the older humanities, and President Butler has very properly urged the need of improvements in this direction.

Standing here, as I do, as a representative of medicine in an association devoted to all the sciences of nature the relation of medicine to general science comes prominently to my mind. Medicine has been called the mother of the sciences. There was a time when the leading cultivators of natural science were physicians and when the medical faculties of universities were the homes of about all the science that then existed. In subsequent history physicians have played no small part in the development of the natural and physical sciences. Such important contributors to physical science as Black, Young, Mayer and Helmholtz were all actively identified with the medical profession, and are important figures in the history of medicine as well as of physics. From the study of chemical and physical phenomena of living animals and of man, whether by chemists, by physicists or by physicians, have come important additions to the sciences of chemistry and of physics, and medicine is constantly finding new and important applications of chemical and physical discoveries. We realize to-day as never before the fundamental unity of the biological sciences, and answers to the deepest and most far-reaching problems of medicine, not less than of other biological sciences, are to be sought in the properties of living matter, wherever it exists, whether in plants or in animals or in man.

Medicine has during the past half cen-

tury entered irrevocably upon the true paths of science. Dogma and transmitted authority are no longer its guides, but it seeks for truth by the only methods found fruitful for all science—experiment, observation and just inference.

The domain which has been opened to medicine during the last quarter of a century by the introduction of new methods and resulting discoveries in the causation of infectious diseases has greatly increased our power to cope with disease, and the masterful pioneers in this new field, Pasteur and Koch, rank among the greatest benefactors of mankind. The wider recognition by governments and by the people of the humane, the economic and the social value of this power of preventive medicine to check incalculable suffering and waste of energy from disease is urgent. One of the most gratifying exemplifications of the useful functions of this association is the initiation by the section on social and economic science of an influential movement for the establishment by the national government of a bureau or department of public health.

This leads me, in closing, to say a few words concerning the scope and aims of this association. Our retiring president, in his introductory remarks, spoke of the great growth of the association, which has more than doubled its membership during the six years since we last met in New York. At its foundation and for many years afterward this association supplied all that was demanded of a national society representative of the various natural and physical sciences. In later years specialization, at once a cause and a result of the great progress of science, has led to the formation of many special scientific societies of national scope, and the end is not yet in sight. It became evident several years ago that the association, in order to retain its usefulness, if not its life, must adjust itself to the new conditions, and this it did by taking the position of a central organization of science with which the various special societies, while remaining autonomous, should become affiliated and constituent units. It can not be doubted that the broad conception underlying this readjustment is the correct one and that its application has already been attended by a large measure of success.

There remain, however, certain difficulties to be overcome and certain problems to be solved before this association shall have attained that ideal of organization and of usefulness to which we may reasonably look forward. The need of such a central, national organization as a coordinating, unifying, harmonizing influence, as an authoritative representative and exponent before the public of scientific opinion and of scientific workers, as an instrument to secure cooperation among scientific investigators, to influence public opinion, to advance the interests of science as a whole as well as to inaugurate and to secure support for special scientific undertakings and lines of investigation, and as a means of securing that most desirable purpose, placed first among the objects of the association in its constitution, 'to promote intercourse between those who are cultivating science in different parts of America'—the need, I say, of a central organization with these aims and others which might be specified demands, I think, a wider and deeper appreciation among the scientific men and women of this country. Especially should our leaders in science realize, as many of them do, the great possibilities of usefulness of this association and work actively for the promotion of its welfare. Larger financial resources are needed to perfect the organization and to enable the association to cultivate more fruitfully the fields which it already occupies and to enter new ones. Within the near future the membership should rise to at least ten thou-

sand. With its history of honorable achievement and its present success this association may confidently look forward to a future of greatly increased power and usefulness for the advancement of science.

I now declare open this fifty-seventh meeting of the American Association for the Advancement of Science, and in so doing I express the hope, which our program indicates to be indeed an assurance, that the sessions and social functions of the association, of the various sections and of the affiliated societies may be full of interest, pleasure and profit to those in attendance.

Our program now calls for announcements by the general and local secretaries. Has the local secretary any announcement to make?

Doctor Cattell: The local arrangements are announced in the general program, which may be obtained in the entrance hall. Notices in regard to excursions and receptions which concern only sections or affiliated societies will be made in those societies' meetings. Perhaps the only thing that needs to be said is that ladies accompanying members are very cordially invited to the receptions that have been arranged. These include the reception by President Butler, of Columbia University, in Earl Hall, at 9 o'clock this evening, a luncheon and general meeting on Saturday at the College of the City of New York, the unveiling of ten busts of pioneers of American Science at the American Museum of Natural History, on Saturday afternoon, and in the evening a reception given by the trustees of the museum and the New York Academy of Sciences, with an exhibition of scientific progress by the academy.

Doctor Welch: We will now hear from the general secretary, Mr. Hayford.

Mr. Hayford: A letter which has just been received from the secretary of the building committee of the United Engineering Societies, which is the holding corporation for the Engineering Society's building. (Reading) "It gives me pleasure as secretary of the United Engineering Society, which is the holding corporation for the Engineering Societies' building at No. 29 West 39th Street, to extend an informal invitation to the members of the American Association for the Advancement of Science to visit our building during the week of the meeting." Signed by F. R. Hutton, secretary.

Doctor Welch: Our printed program contains the detailed announcements. It is in order to move an agreement on the hours of the meeting.

Doctor Smith: I move that the hours of the meeting of the various sections be as specified in the printed program. (The motion being seconded, the president put it to a vote, which being unanimously in the affirmative, the motion was declared carried.)

Doctor Welch: The session is now adjourned. The association will meet again on Tuesday morning at ten o'clock in this hall.

THE POLICY OF THE CARNEGIE INSTITUTION[1]

Since the trend of development of the institution still hinges to some extent on the relative merits of large projects carried on under the direct supervision of the institution itself and of small projects committed to individuals whose affiliation with the institution may be only temporary, a large amount of attention has been given to this question during the year; much more in fact than to any other. It is a matter of daily correspondence, of daily interviews and of daily importunities. With a desire to see all sides of this question and to hear

[1] Concluding part of the report of the president, 1906.

all arguments thereon, the president has solicited much of this correspondence and many of these interviews. He has received a wealth of highly esteemed advice and suggestion along with much more that must be characterized either as impracticable of application or as fraught with grave danger if applied.

A considerable portion of this advice and suggestion would make instructive reading if printed, although they are in large degree conflicting and need, obviously enough, here and there, correction for personal equation; but, aside from greater concentration on matters of detail, they do not differ essentially in the aggregate from the advice and suggestion given by members of the advisory committees whose reports are printed in the earlier year books of the institution. Hence it does not seem worth while to add to the bulk of printed discussion along this line, even in the cases of correspondence whose authors would doubtless approve publication of their views. The president desires here, however, to express his warm appreciation of the counsel on this question given him confidentially by many colleagues in the academic and scientific world. Whether this counsel has been pro or con as regards his own views an effort has been made to weigh it fairly.

In the meantime there have been some opportunities for reflection on the various aspects of the question, while the institution is accumulating experience which, though not as yet conclusive in its bearings, furnishes important indications of the lines along which development may be expected to be effective or ineffective. It seems desirable, therefore, to state here some of the provisional conclusions to which observation, experience and reflection have forced me, not without opposition, in some cases, to preconceived notions.

Categorically these conclusions are the following:

First, that the institution may not advantageously enter the fields now occupied by colleges and universities. It should be no part of the function of the institution to endow scholarships and fellowships for indigent students, nor to supply helpers, assistants, apparatus, libraries, museum collections, etc., for purely educational work, nor to supplement meager salaries of college and university professors whose work is primarily educational. This conclusion and the specifications enumerated seem so axiomatic that their statement would be quite superfluous here if the institution were not daily importuned for aid in one or more of these and many similar ways. Some eminent minds maintain, indeed, that since the object of the institution is, in the last analysis at any rate, educational, these numerous ways of promoting education should not be overlooked, for the sphere of effective influence of the institution, it is argued, may be thus widely extended. The experience of the institution thus far, however, appears to be in direct opposition to this view. We are learning how the giving of aid by one institution to another, even indirectly, tends to sap the independence and to diminish the available income of both. Moreover, we encounter by this method the endless difficulties arising from diverse interests and divided responsibilities, along with the inevitable bitterness of disappointment from those who feel that the distribution of funds has not been equitable amongst the fields of research or amongst the institutions supplying the investigators.

Secondly, that the institution may not advantageously seek to scatter its resources simultaneously over all available fields of research. It should rather choose a limited number of fields of activity at any epoch and concentrate its energies on these until

they are brought to a satisfactory degree of completion. This conclusion seems likewise almost axiomatic, since it is determined essentially by a limited income. Many, if not a majority, however, of highly esteemed colleagues oppose this conclusion, and argue that a distribution of income in small grants to widely scattered investigators will be more productive in immediate results and of more ultimate benefit to society. But this argument does not appear to be supported by the experience of the institution. It is impossible, of course, to draw precise inferences from this limited experience; but after a careful examination of the facts at hand I think it safe to state that no direct return may be anticipated from more than half of the small grants made up to the present time for minor researches and for research assistantships. Moreover, it appears to me that this is as high a percentage of efficiency as may be reasonably expected from miscellaneous applicants for aid, since a majority of them will be men and women of enthusiasm and promise merely rather than of demonstrated ability to carry researches to successful conclusions.

In weighing this matter the educational value of such widely scattered aid should not be overlooked. Many a meagerly equipped laboratory or library may be thus strengthened and many young men and women may be thus trained for work of research. The possession of a piece of apparatus, or a rare volume, or the opportunity to pursue early in life a year or two of uninterrupted scientific investigation, is, doubtless, of inestimable value to a few individuals. But the obvious objection to such a disposition of resources is that it serves only to supplement the educational work of colleges and universities. They already occupy this field, and it appears unwise as well as unfair to encroach on their domain even in a supplementary way. A less obvious objection is that arising from the diverse interests and the divided responsibilities which such a course entails. It may be observed also that as regards themselves the experience of colleges and universities appears to be inimical to such a course, for we have not heard of any of them proposing to use its income, or any considerable share thereof, in building up departments of educational work in other institutions. But the fundamental objection to such a disposition of funds is that it promotes research only indirectly, whereas the primary object of a research institution should be to promote research directly. A research institution should aim to take up investigations which, by reason of their expense or magnitude, are not likely to be carried to completion in other ways. And in the pursuit of this work it should be free to choose the best ways and means; it should not be hampered by a host of applicants backed by endless recommendations of doubtful validity.

Thirdly, that the institution may advantageously limit much more narrowly than hitherto the award of minor grants. It should seek to eliminate the amateur, the dilettante and the tyro as far as possible from the list of eligible applicants, and concentrate attention chiefly on those who have already demonstrated ability to produce results. This policy will restrict the range of operations of the institution to some extent, but it will diminish the hazard to a greater extent, and will permit a degree of thoroughness of work not otherwise attainable.

One of the most serious objections to giving aid to numerous small projects lies in the fact, amply shown by experience, that the estimates of the cost thereof are generally vague and almost always too small for the accomplishment of good work. Many, if not most, authors of such projects proceed without plans and specifications,

often ignoring somewhat contemptuously such estimates of cost and probable outcome as may be supplied in most cases by judicious forethought. The projects are so small that it does not appear essential to individual investigators to consider carefully their cost and bearing. Indeed, only investigators of considerable experience are able to use adequate forethought in this respect. But when one contemplates not a single small project, but the aggregate of a large number of them, the need for carefully drawn plans, specifications and estimates is seen to be as important as in the case of any large project.

By limiting the fields of activity in this direction it will be possible for the institution not only to make a choice amongst promising investigations, but likewise to make a choice amongst tried investigators. This appears to me to afford a workable compromise also between the extremes of a limited number of large projects and an unlimited number of small projects—a compromise whereby the essential advantages of both extremes may be secured and their inherent disadvantages avoided.

But while it appears desirable to limit the range of activity of the institution at any epoch, it appears still more desirable to insist on a high standard of efficiency determined by the quality and the quantity jointly of results attained. To secure this end the institution must not only seek to aid mainly eminent investigators, but it must seek to aid them for such periods and to such an extent that their best efforts may be enlisted. The grantee should be able to feel that his connection, though temporary, with the institution is creditable, and, reciprocally, that the aid he accepts implies higher obligations than those attaching to an educational scholarship or fellowship. In many cases within the experience of the institution grantees appear to have regarded the system of small grants as a sort of lottery, involving neither credit to nor responsibility from either party to an award. Experience of this and similar kinds is inevitable, however, in the formative stages of the institution; for the distinction between a research institution and an educational institution is not yet so clearly defined that contemporary society can avoid attributing to the former the eleemosynary function which is being slowly eliminated from the latter.

In conformity with the views here set forth the president is disposed to recommend that in general minor projects be aided only when they can be carried on by investigators of known competence; that such investigators become for the time being affiliated to and advisers of the institution, and that they be designated as research associates of the institution. The periods of affiliation of such associates must be determined, of course, by the circumstances of individual cases. But it may be observed that as a rule these periods will be from two to five years, or more, since few investigations well worth undertaking by the institution can be brought to satisfactory conclusions in shorter intervals of time.

It appears worthy of note, from the point of view of evolution, that the institution finds itself occupied with two principal divisions of activities, namely, those arising from its internal affairs and those arising from its external affairs. On the one hand, we are busily engaged with many investigations, in many diverse fields, carried on under widely varying conditions. On the other hand, we are equally busily engaged with a multitude of external relations which are usually more or less conflicting and often incompatible. Thus the development of the institution may be likened to the struggle of an organism which is trying at once to discover its

proper functions and to adjust itself to the conditions of its environment.

It is worthy of note, also, from the same point of view, that this struggle is inevitable to a great degree, and that it is only out of the resulting chaos of opinions as to ways, means and methods, and out of the experience of the institution itself, that definite and approved lines of action and policy may be attained.

In view of these circumstances, it seems essential to warn our allies of the academic world and the public at large against the danger of expecting more from the institution than is possible of accomplishment in a limited time and with a limited income. Although the work of the institution is in a peculiar degree novel and untrammeled, it is yet subject, properly enough, to the restrictions set by human experience and by contemporary society. Hence, if the reviewer of the year books finds reason to complain of a bewildering array of technical details, he should reflect that this array is far less than a host of investigators would like to have it. If the humanist or the scientist finds reason to complain that little or no aid has been given to him or to his special field of research by the institution, he may derive comfort from the fact that he is one of an overwhelming majority necessitated by the limitations of available resources. And if the bibliophile has found reason for dissatisfaction in the distribution of the publications of the institution, he may be disposed to be lenient with the latter on learning that he is one of many thousands soliciting favors.

Out of this plexus of internal and external relations and interrelations it is the duty of the administrative branch of the institution to evolve, so far as practicable, such a degree of order and system as will best promote productive and thorough work of research, and at the same time to restrict, so far as practicable, an unproductive or wasteful expenditure of energy and resources. Although progress towards an adequate fulfilment of this duty must be of necessity slow in order to be sure, it is believed that distinct advances are accumulating, and that the obvious difficulties and dangers which beset the development of so novel an institution are only such as may be overcome by a reasonable application of time and patience.

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SCIENTIFIC BOOKS

The Principles of Heredity. By G. Archdall Reid. London: Chapman and Hall.

The problems presented in the study of heredity are so diverse and so intricate that they should be illuminated by data drawn from all fields of biological science. Possibly, the phase of the subject which has been the least systematically studied is that of the evidence bearing on heredity afforded by disease, and the publication of a volume by a medical man of high scientific attainments, which embraces this neglected data is to be welcomed. The existence of statistical records makes it possible to utilize the observations made on the inheritance of diseases, and, in this particular field, 'The Principles of Heredity' is a contribution deserving of much consideration. Dr. Reid, the author, has made notable contributions to the study of evolution and heredity in earlier works, as 'The Present Evolution of Man' and 'Alcoholism. A Study of Heredity.'

The analysis of the subject of heredity is now changing from the stage of general treatment to a very critical one, based on measurements and experiments, as well as on the closest microscopic examination of the hereditary substance and its behavior during initial stages of development. This makes it difficult for any writer to satisfy present standards. It will be appropriate to examine Dr. Reid's work with this situation in mind.

The title of the book, 'The Principles of Heredity,' leads the reader to expect something

more than appears in it. The biological student, be he medical man or layman, will be disappointed that the author does not mention, in any adequate way, in his chapter on 'Theories of Heredity,' the recent work of students of cytology as laying the foundations for a scientific study of the subject. The compensation for this insufficient treatment of a fundamental aspect of the subject is to be sought in the introduction of new matter from the field of observation of the medical man. But, this is not altogether satisfying.

The results achieved by the application of biometrics to studies of heredity, and by experiments, along lines suggested by Mendel's researches, are also omitted. The chapter on 'Theories of Evolution' and the subsequent consideration of the theories mentioned are likewise disappointing. This is not, as it appears to the reviewer, because the statement of the theories is necessarily brief, but because it is superficial and dogmatic.

The presentation of the subject is more argumentative and speculative than closely analytical. The pages abound in great vigor of statement, but the positiveness of the author's position on controverted matters detracts from its worth. The book appears to be written with little scholarly reserve, and one misses in it the fine balance of statement which has been set as a standard by earlier writers in the same general field, even as far back as Lamarck, and so fully exhibited in Darwin's works and in the last edition of Weismann's 'Lectures on the Evolution Theory.' Therefore this book, although introducing much new matter, does not appear to rise to the level of current standards in the serious discussion of the principles of heredity.

A few quotations will serve to illustrate the vein in which the discussion is carried on:

"At first sight it would appear an easy matter to test the truth of the Lamarckian doctrine of heredity. We might, for example, amputate the tails of a pair of parent dogs, and then observe whether puppies, subsequently born, were tailless. But the theory is not held in this crude form, at any rate by the scientific supporters of it." The suggestion that observations upon the progeny of one pair of parent dogs might give results of scientific value is too superficial, and should be accompanied with a reference to the work of experimenters on this very point, such as the following by Weismann of the effects of amputating the tails of both parents, through twenty generations of mice. Many similar instances occur, where a general statement is made without reference to any recent data. The author's discussion of the inheritance of acquired characteristics, although we agree with his main contention, is not up to the standard of that of a number of writers of the past few years.

In portions of the book the author goes at his task like a special pleader. The outline of Chapter XII. on 'The Argument from Disease' is characteristic: "The Lamarckian doctrine is certainly untrue. It is equally untrue that hereditary tendencies may be easily changed by the direct action of external forces —Professor Cossar Ewart's observations."

Page 14: "The Bathmic theory of heredity and evolution may then be ruled out of court. We are left with the Lamarckian and Neo-Darwinian doctrines. One or the other or both combined must furnish the true explanation of evolution." The use of *must* in this connection is an illustration of what is meant by the author's positive form of statement, as is also 'The Lamarckian doctrine is certainly untrue.' The author might properly reach these conclusions after a suitable examination of the data bearing upon the matter, but what one misses is the essence of philosophical opinion, and the reader is to be excused if he reaches the conclusion that the writing is a weak discussion of underlying principles. While a limited class of readers may like to have debated questions so directly disposed of, the large body of scientific readers will take exceptions to this summary way of dealing with them.

After one page of general statement the author says, page 15: "We need not multiply instances; the Lamarckian doctrine should now be plain to the reader." But to one at all acquainted with Lamarck's writings, the impression remains very strong that La-

marck's doctrine can not possibly be plain to the reader from the author's presentation of it.

The book not only lacks evidences of seasoned thought, but of familiarity with the more recent literature bearing on the discussion of heredity, and, on the whole, is a disappointing analysis of the subject. Nevertheless, we believe it will be of service on account of the new point of view adopted and the citing of evidences bearing on heredity furnished by disease. Doubtless, this volume will assist materially in getting medical men to pay more attention to the matters discussed in it. If this be the case, the purpose of the book, as stated by the author in his preface will be justified: "I have addressed the volume mainly to medical men. The evidence relied on is drawn largely from medical sources; medical men form the largest body of scientific workers; they deal continually with questions of heredity, a knowledge of which is of great importance to them; but in a measure they have neglected the systematic study of the subject. Little or no instruction is given in it to medical students. There does not even exist a text-book to which they may refer. But a knowledge of heredity is becoming essential to the educated doctor. I have sought to supply the want. I hope, however, the professional biologist and the general reader will not find the work devoid of interest."

William A. Locy

Postelsia, The Year Book of the Minnesota Seaside Station, 1906. St. Paul, Minnesota. 1906. Pp. 364. Small octavo.

Four years ago the first volume of this unique publication was issued, and now we have a second volume so like the first in paper, print, illustrations and bindings that it seems a fit companion for it upon the shelves of the botanist's library. Like its predecessor, the present volume contains seven papers, with a half-page 'Word of Introduction' from Professor MacMillan, the director of the Minnesota Seaside Station. The first paper, 'Observations on Plant Distribution in Renfrew District of Vancouver Island,' by C. O. Rosendahl, occupies more than one third of the volume. In it the writer first discusses the marine formations, then the formations of the beach, and the formations of the forest country, and follows with an annotated systematic list of the pteridophytes and spermatophytes of the region. His conclusion is "that the flora of Vancouver Island, in so far as it can be judged by observations confined to a limited area of the same, is typically boreal, with an admixture of more arctic forms than the latitude, the elevation above sea-level, and present climatic conditions would indicate." The second paper, by F. K. Butters, on 'The Conifers of Vancouver Island,' describes thirteen species as occurring spontaneously on the island, viz., *Taxus brevifolia,* a shrub or small tree; *Pinus contorta,* a small tree; *Pinus monticola,* a tree 30 meters or more in height; *Picea sitchensis,* 'tidel and spruce,' attaining 60 meters in height and two meters in diameter; *Tsuga mertensiana,* 'mountain hemlock,' a tree of the alpine regions; *Tsuga heterophylla,* 'western hemlock,' a tree nearly as large as the tidel and spruce; *Pseudotsuga taxifolia,* 'Douglas fir,' a large tree of 'magnificent proportions'; *Abies grandis,* 'white fir,' a tall, slender tree; *Abies amabilis,* 'white fir,' 'a tall tree with a straight, slender trunk'; *Thuya plicata,* 'cedar,' a large tree, 'not infrequently five meters in diameter at the base'; *Cupressus nootkatensis,* 'yellow cedar,' a tree of moderate size; *Juniperus communis sibirica,* 'juniper,' a dwarf, trailing shrub; *Juniperus scopulorum,* 'western red cedar,' a small tree. The author thinks it 'probable that further exploration of the higher mountains of the interior will reveal from one to three other species of the *Abietineae.*' In the third paper, A. W. Evans makes an annotated list of 71 species of *Hepaticae* collected principally by members of the Seaside Laboratory. 'Some Western Helvellineae' is the fourth paper by D. S. Hone. It is followed by a paper by R. F. Griggs describing a new genus of kelps, *Renfrewia,* related to *Laminaria* and *Cymathere,* from the Vancouver coast near the Seaside Laboratory. But one species, *R. parvula,* has been discovered. Isabel Henkel's 'Study of Tide-pools,' and Professor C. W. Hall's 'Geological Features of the Minnesota Seaside Station' are interesting geological

papers with excellent half-tone illustrations. A full index closes this most interesting volume, which in the words of the editor "will be a souvenir to those who know the Vancouver coast and love the memories of the happy days and nights under the sheltering roof of the 'Sea Palms,' or beside the white water." To others it will certainly justify the hope that it 'will have some scientific and permanent value.'

CHARLES E. BESSEY
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SOCIETIES AND ACADEMIES

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 419th meeting was held on November 3, 1906, President Knowlton in the chair and twenty-seven persons present.

Dr. Theo. N. Gill presented the first paper of the meeting, on 'The Work of Pterophryne and the Flying-Fishes.' The combination of two such different fishes as sargasso fish, or *Pterophryne,* and the exocœtoid flying-fishes is the index of a curious history.

In December, 1871, one of the most accomplished naturalists of the nineteenth century, Professor Louis Agassiz, made a famous voyage for discovery to Brazil and while traversing the Gulf Stream, found a globular nest-like mass of sea-weed filled with eggs, which he examined and noticed in a letter published in the *American Journal of Science.* These eggs were identified as those of the sargasso fish, now generally known as *Pterophryne histrio.* In 1887 many more such masses were found in the sargasso meadows off the coast of Africa, and, accepting the identification by Agassiz, Professor Leon Vaillant explained how the *Pterophryne* made the nest. In 1894 Professor K. Möbius described still more in detail the eggs and nest and likewise assumed the correctness of the identification of the mass as a nest made by *Pterophryne.* He described in detail and figure the bipolar filaments of the eggs found in connection with such masses and found, by examination of the ovaries of a *Pterophryne,* that the ovarian eggs had no filaments and were smaller than the eggs found in the nest-like masses. He consequently postulated that the filaments must be acquired during the passage of the eggs through the oviduct. Such were the opinions up to last year. It was then found that the *Pterophryne* had nothing whatever to do with the nest-like masses of sargasso!

In the fall of 1905 Dr. Hugh Smith invited the speaker to call at his office and see some eggs that had been laid by a *Pterophryne* in an aquarium under his own observation. To his surprise, those eggs had no filaments and were smaller than those that had been described by Möbius. Subsequently Dr. E. W. Gudger sent him a notice of similar eggs and explained that they were extruded in a long jelly-like mass, in fact like that issuing from an angler (*Lophius piscatorius*).[2] It became evident, therefore, that the nest-like masses of sargasso must be made by a very different fish from the *Pterophryne.* The only eggs like those found in the sargasso weed are those of flying-fishes. In fine, the nest-like masses of sargasso are not made by any fish at all, but by the eggs themselves. The eggs must be laid on the fronds of the weed and the long motile tendril-like filaments clasp the finely cut branches of a frond till a globular mass is brought together. As Professor Agassiz had not noticed any bipolar filaments on the eggs examined by him, Dr. Gill thought it was possible that a lot of the eggs of a *Pterophryne* might have drifted in a mass with flying-fish eggs. The different times of oviposition of the sargasso-fish and the maker of the nest-like masses, it is true, were an objection to such a hypothesis, but it was assumed that there might be exceptional coincidence. To test the hypothesis, Dr. Alexander Agassiz, the discoverer of the peculiar oviposition of the angler, sent eggs taken from outside of a nest-like mass figured by him and they proved to have the filaments characteristic of flying-fishes. That hypothesis must, therefore, be abandoned, and the one crediting the formation of the nest-like masses to the flying-fish alone be accepted for the present at least.

Dr. Hugh M. Smith in discussing the subject described the spawning of *Pterophryne*

[2] See 'A Note on the Eggs and Egg-laying of *Pterophryne histrio,* the Gulf-weed Fish,' by E. W. Gudger, in SCIENCE, December 22, 1905.

in captivity and exhibited one of the characteristic egg-rafts and a photograph of another. During September, 1906, three fishes that had been under his observation in the aquarium at Woods Hole for some time spawned. The rafts were quite transparent, somewhat elastic, and non-adhesive, and floated at or near the surface in a partly collapsed condition; they were from 45 to over 90 cm. long, about 7.5 cm. wide and about 6 mm. thick, with abruptly tapering ends; the eggs are .6 mm. in diameter and exceedingly numerous, thickly infiltrating the jelly. One fish that produced a band of eggs 45 cm. long on September 24 laid another string 92 cm. long on October 8. The consecutive ripening of the ovaries is doubtless normal, but there is at least one observation (at Woods Hole, several years ago) of the simultaneous discharge of two egg-bands. In none of the cases where these fishes have spawned in captivity have the eggs been fertilized, and the embryology remains unknown.

The second paper was by Dr. M. W. Lyon, Jr., on 'Local Races of Bornean Squirrels.' He exhibited eight different forms of squirrels of the *Sciurus prevostii* group found in northern and western Borneo, pointing out their characters and showing how the extreme forms were connected by forms possessing intermediate characters. Material at the present time is not sufficient to show complete specific intergradation. A large river proved a very effectual barrier in separating two very distinct races. In the discussion which followed, Dr. Hitchcock asked if two or more of the exhibited races coexisted in the same locality. Dr. Lyon replied that such was not known to be the case, and that as a rule among mammals when two species of the same genus inhabit the same area, they usually belong to very different groups in that genus or to different subgenera. He thought that the squirrels under discussion should form a distinct subgeneric group. Dr. Gill deplored the increasing number of genera and subgenera based on slight characters. Dr. Stiles remarked that in some groups of animals a good criterion for establishing genera had been found when two forms possess a character not found in a third form; two distinct genera are then present, but the author he referred to makes no use of subgenera in this scheme. Dr. Stejneger said that whether definite natural groups were called genera, subgenera or comprehensive species was merely a matter of definition of terms, the facts expressed remained the same. Dr. Lyon thought the multiplication of genera and species was deplored by the non-specialist but was of much assistance to the specialist in any large group of organisms.

The third paper was read by Mr. Karl F. Kellerman, on 'The Use of Copper in Sanitation.' It is evident that a scourge of polluting algæ is an emergency condition. The employment of copper sulphate to eradicate this pollution is satisfactory both from the theoretical and the practical standpoint. Similarly, copper treatment of unfiltered supplies for the purpose of controlling or stamping out waterborne diseases should be considered an emergency contingency and should never be more than a temporary expedient which local conditions might make necessary until permanent means of purifying the water could be established. The question of sterilizing or disinfecting a water supply even two or three years ago was looked upon with great disfavor, but is now recognized by sanitary engineers to be necessary or at least desirable in some cases.

Many chemicals have been proposed to effect sterilization of this character, among which, besides copper, may be mentioned electrolytic chlorine, ozone, lime, silver chloride and various specially named trade products. The selection of the most suitable chemical and the method of applying this chemical for continuous disinfection of a water supply are problems for the future. Such treatment probably will be carried on in connection with filtration, both because of the greater opportunity for removing the chemical employed and because of the necessity of keeping the water free from sediment and similar impurities.

As with the algæ, the different species of bacteria vary in their sensitiveness to copper. Many of the saprophytic bacteria usually present in water are highly resistant, some,

which are usually regarded as water bacteria, are extremely sensitive; *Bacillus typhi* and *Bacillus coli* seem somewhat between the two extremes.

Emphasis should be laid upon the intimate relation between sewage disposal and water purification. Proper sewage disposal, whether the varying conditions mean that this should be interpreted as sterilization or merely slight improvement, is logically the first step in the problem of securing and maintaining a safe and potable water supply.

The use of copper in sterilizing a sewage or in improving the quality of the effluent from a sewage purification plant is in many ways comparable to the use of copper for the purpose of removing pathogenic bacteria in a municipal water supply. Briefly, the use of copper in sewage treatment should be restricted to occasionally treating crude sewage from small communities where the initial expense of installing a sewage disposal plant is prohibitive, in improving the effluent of sewage disposal plants of poor quality and in the emergency of an unusual and serious accident to a sewage disposal works.

M. C. MARSH,
Recording Secretary

THE AMERICAN CHEMICAL SOCIETY
NORTHEASTERN SECTION

THE seventy-second regular meeting of the section was held in the rooms of the Trade Club, 77 Summer Street, Boston, on Friday, December 21, with President L. A. Olney in the chair. About forty-five members were present.

Dr. W. C. Bray, of the Research Laboratories of the Massachusetts Institute of Technology, presented a paper by Professor Arthur A. Noyes and himself upon 'An Improved Scheme of Qualitative Analysis for the Tin Group, including the Detection of Platinum, Gold, Selenium, Tellurium and Molybdenum.' The work upon which the paper was based was begun at the Massachusetts Institute of Technology some six years ago, under Professor Noyes's direction, and has been continued to the present time. The analytical scheme is to be universally applicable, and to include all the elements. It will permit of the detection of quantities as small as one or two milligrams of any element in a mixture. The innovations of the system are especially this quantitative character of the work and the systematic method devised for preparing the solution of the substance for analysis. In this paper only that part of the scheme which related to the tin group was considered. It was shown that in the cases of the sulphides of arsenic, antimony and tin, 1 milligram of any one of the three, could be detected in the presence of 500 milligrams of either of the others. In the case of platinum, gold, selenium, tellurium and molybdenum, the quantities which could be detected ranged from one half to one milligram in 500. Confirmatory tests have been introduced in all cases where the original test might be misinterpreted through faulty work on the part of the analyst. Demonstrations of several of the tests were made, to show the characteristic reactions: Thus, the separation of selenium and tellurium by solution in concentrated hydrochloric acid, and reduction and precipitation of the selenium in the cold solution by sulphurous acid—a bright red precipitate separating. The tellurium may then be precipitated by diluting the solution and adding potassium iodide, whereby a black precipitate falls. The precipitation of gold by means of oxalic acid, yielding a purple precipitate, and the detection of molybdenum by use of potassium sulphocyanide and metallic zinc, whereby a brilliant red color was obtained, which soon faded to pale yellow as the reducing action of the zinc continued, were also shown. In the discussion of the paper the speaker brought out certain objections to the usual Marsh test, and showed the advantages of the proposed procedure, in which the magnesium-ammonium arsenate precipitate is redissolved in hydrochloric acid, and the arsenic again thrown out with hydrogen sulphide. The method of separating tin and antimony was also dwelt upon.

FRANK H. THORP,
Secretary

DISCUSSION AND CORRESPONDENCE

GASTROLITHS

In extension of a recent note by Mr. Geo. L. Cannon on the occurrence in southern Wyoming and Colorado of sauropodan gastroliths[1] similar to those first reported by me from the Big Horn Mountains,[2] I wish to state that a recent search through the Yale collections has not revealed any further examples directly associated with Dinosauria.

Meanwhile, however, I have been shown, by Mr. Barnum Brown, four additional specimens obtained in Colorado in proximity to various dinosaur skeletons. These gastroliths are very highly polished, and it is noteworthy that one of them contains a fine bryozoan and traces of other marine organisms identically similar to those noted in one of the examples from the Big Horn Mountains. In fact these specimens are so entirely similar in both texture and the fossils contained as to make it quite certain they were derived from the same source, namely, a marine formation containing siliceous nodules in much the same manner as the English chalk cliffs—or to cite a somewhat different instance, certain moss agate-bearing carboniferous terranes of the Laramie Mountains.

Nor is it improbable that the original source of these fossil pebbles may soon be found, and thus still more closely locate the actual habitat and haunts of the sauropods. At least it already appears that the dinosaurs of the Big Horn and Colorado localities either picked up the fossiliferous nodules on the same ancient shore line, or else from streams which cut this line along some inland range of hills or mountains and carried the pebbles forward into the lower river courses. In the latter and more probable case the dinosaurs would have found the transported fossil bearing pebbles intermingled with a variety of others just as in the two occurrences now observed.

It should be definitely stated that the dinosaurian gastroliths are unmistakable objects. Pebbles which are merely waterworn rarely have other than ground glass surfaces, and where a partial polish approaching a sheen is present, this does not markedly extend into depressions, and is much interrupted by various irregularities. So also the wind-worn pebbles of steppes, although I have seen near the glacial ice sheet limit of eastern Nebraska large boulders of Sioux quartzite presenting small polished areas due to æolian action; while in the case of the readily determinable desert *patina* the glassy surfaces are of a somewhat different origin. But from all these the dinosaurian gastroliths will never fail of recognition. Except for the original inequalities of the pebble outline, though even these may be nearly eliminated, their entire surface may exhibit a higher polish than wind or water ever produces. Indeed the smoothness and sheen are, I may say, from my section making, such as is difficult to equal, and best compared to the finest results obtained by the use of the buffing wheel.

It is evident that the dinosaurs were more or less given to selecting the pebbles they swallowed, choosing the brighter colored ones, much as do the ostriches and other birds. And it appears that pebble-swallowing is quite widely characteristic of not only reptiles and birds, but occasionally of other vertebrates. The fur seal, a mammal of 'strong instincts, but little intelligence,' and with shore habits perchance not utterly dissimilar from those of the ancient pebble-swallowing plesiosaurs, as stated by Lucas, quite frequently swallows among other objects pieces of lava, and chalcedony pebbles, with apparently more or less choice.[3] In none of these other instances, so far as yet known to me, however, are the pebbles long retained and subjected to the high polish seen in the case of the dinosaurs. Strong in gastric secretion, the sauropods perchance sometimes ate, in addition to more succulent plants, primitive or xerophyllous grasses containing considerable silex. But as the gastrolithic habit was doubtless widely characteristic of the entire dinosaurian group, the gastroliths of carnivorous forms will probably be determined, and the degree of attritive

[1] Science, N. S., Vol. XXIV., No. 604, p. 116, July 27, 1906.

[2] *Ibid.*, Vol. XXIII., No. 595, pp. 819–821, May 25, 1906.

[3] 'The Fur Seal and Fur Seal Islands of the North Pacific Ocean,' Part III., page 68.

polishing seen in them will be of some interest in this connection—bearing in mind, of course, that the dinosaurs exhibit such a wide range of skeletal structure that it has been more than once seriously proposed that they can scarcely be all included in the same reptilian order. Nevertheless, if the doubts recently expressed by Dr. Eastman as to any possibility of inferring stomach structure from the presence of gastroliths,[4] find some justification, it is certainly a fact of singular and widening interest that the dinosaurs swallowed and retained and polished far more highly than seen anywhere else in nature, the hardest quartz. The stronger inference by far is that their stomach structure was different from and more complicated than in existing reptiles. And naturally a stomach especially suited to grinding action analogous to that of birds first calls itself to mind.

G. R. WIELAND

DEAFNESS IN WILD ANIMALS

TO THE EDITOR OF SCIENCE: An interesting case of deafness in wild animals came to my attention this season and the conditions seem so simple as to suggest that, possibly, the loss of the sense of hearing or of smell may be no uncommon thing. I should be glad of others' notes on the subject.

In the great semi-arid regions of the west the struggle for existence is so strenuous that the special senses are very highly perfected. Especially is this true of the sense of hearing as evidenced by the enlarged external ear in many forms. The coyote (*Canis ochropus*) is especially marked with this enlarged concha and undoubtedly has, under normal conditions, a very keen sense of hearing. Popular report endows him also with almost supernatural sense of smell. The individual of the species must then labor under a decided handicap if the hearing be destroyed or the sense of smell even slightly impaired. The instance which I cite suggests that such may be often the case.

In cleaning a pair of skulls of this species which I obtained in August last, I found in the case of the male that both ears were crowded full of the bearded seeds of the common fox-tail grass (*Hordeum murinum*) which is such a pestiferous weed in the southwest. The seeds were packed closely into the tympanic chamber and the beards were very much darkened by having remained in the ear some time subjected to the exudations from the inflamed surfaces. In the same individual a fully bearded seed was found in the left nostril worked well up among the folds of the turbinated bone.

The second specimen, a female, taken at the same time, had the grass seeds in both ears but none in the nostrils.

The ear bones showed no sign of necrosis, though the seeds were in direct contact with them. Hearing was undoubtedly destroyed and, in case of the male, the sense of smell must have been impaired.

The animals were taken by strychnine poisoning with a bait of watermelon, a crop the coyote injures extensively in the sparsely settled regions. The specimens came to my hands in the meat; they were in good flesh and pelage. There was no possibility of the seeds having gotten into the ears and nose after death.

The possibility of frequent occurrence of the condition is suggested (1) by the fact that both ears of both animals had been destroyed; (2) by the great abundance and wide range of the species of grass in the case; (3) by the extreme penetrating power of the seed. Each seed tuft is very sharp pointed and is armed with three stout, serrated awns an inch long which force the seed onward with great persistence at each motion of the surface with which it is in contact.

LOYE HOLMES MILLER
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INTERROGATORY LABELS FOR CERTAIN KINDS OF MUSEUMS

TO THE EDITOR OF SCIENCE: If teachers have learned that it is wise to 'exercise much self-restraint in regard to telling children what they' should 'discover for themselves,' may it not be a wise policy for workers in certain kinds of small museums, and in purely educa-

[4] SCIENCE, N. S., Vol. XXIII., p. 983, June 29, 1906.

tional departments of museums, to consider the same idea, at least in the labeling of certain exhibits for specific classes of society and for certain purposes?

I do not recall ever having seen an exhibit labeled in such a manner as to indicate that a study had been made of "the art of questioning, by which the children" and the public "are directed, inspired and attain the desired mental growth. Telling the wrong thing and at the wrong time deadens interest and stunts the child's powers. Whenever practicable, the material should be observed first in its natural environment." In such a museum department the labels might describe that environment, giving the locality, etc., but leave the visitor to make some discoveries. By a process of this kind he would be forcibly impressed.

I would not by any means suggest that specimens in museums are over-labeled or that the best forms of existing labels should be set aside, but rather that if a few interrogatory labels and exhibits were tried as an experiment in a case or two, it might open up a new line of possibilities to workers in certain departments of museums and in some kinds of museums.

The quotations above are from a syllabus on nature study for the primary grades for normal college students by William Hittell Sherzer, Ph.D.

Harlan I. Smith
American Museum of Natural History,
December 7, 1906

SPECIAL ARTICLES

NOTE ON THE COMPOSITION OF LIMULUS BLOOD ASH

Within recent years much attention has been given by physiologists and pharmacologists to the chemical condition of automatic tissues. It is generally conceded that a complete knowledge of the chemical reactions going on in the tissues would go far towards clearing up the mechanism of automatism. The rôle played by the inorganic constituents of the plasma has received particular attention. The principal organs used in the study of automatism have been the heart and ciliated epithelium. Little work has been done toward finding out to what extent the automatism of the ganglion cells depends on the chemical changes going on in cells or in the surrounding fluids during the activity of the cells. The respiratory center in vertebrates is not readily isolated for such study. Neither can most of the work done on the vertebrate heart be applied to the ganglion cells themselves, because in most of these experiments the results are complicated by the simultaneous action of the chemicals on the heart muscle.[1]

This may account in part for the existence of the two theories of the origin of the heart beat. It may be that a more exact knowledge of the chemical changes taking place in the heart muscle, the ganglion cells and their surrounding fluids, will explain the reason for the existence of these divergent views. The importance of data on the chemical reactions taking place in the ganglion cells, especially during activity, is obvious. Such data would lead either to important generalizations or to the refutation of generalizations already made.

On account of its unique anatomy, the Limulus heart offers the best organ known for the study of ganglion automatism. The heart may continue to beat rhythmically for days after its removal from the body. The optimum temperature for keeping up this activity is from 15° to 20° C. (Carlson). The ganglion is easily dissected from the heart without injuring its connections with the heart muscle through its numerous nerves. The heart thus serves as a delicate indicator for the activity of the ganglion.

Carlson[2] has made use of this preparation in the study of ganglion automatism. The chemical phase of this investigation requires a knowledge of the composition of the Limulus blood plasma, particularly the inorganic constituents. A qualitative and quantitative analysis of the plasma during both rest and activity, may give a better understanding of the mechanism of automatism. If we find that there are certain changes in the composition of the plasma during activity of the ganglion or heart muscle, we may conclude that

[1] Carlson. Personal communication.

[2] Carlson, A. J., *Am. Journal Physiol.*, 1906, XVI., p. 221; XVI., p. 378.

these changes are causally related to such activity. The change in potential produced by a slight chemical change in a complex solution like the plasma may be of greater significance than a corresponding change in the potential of a simple solution of its inorganic constituents. For even a slight change in the plasma during activity may be sufficient to modify or to neutralize the electrical potential between the proteid complex in the cell and the solution in which it is held. This might result in the precipitation of the proteid complex, or sufficient change to act as a stimulus.

At the request of Dr. Carlson, who has been working on this problem, I made an approximate analysis of the Limulus blood, not knowing of the analyses already made by Genth and by Gotch and Laws.[1] The results of the three analyses agree so closely that all of them are given. No attempt has been made by me to find how the acids and bases are combined except the usual routine methods given by Hoppe-Seyler and the methods adopted by the A. O. A. C.; both of these methods were used wherever they differed.

BLOOD ASH OF LIMULUS.

	Genth.		Gotch and Laws.
NaCl	83.50 %	79.207	85.184
KCl	2.395	4.667	2.707
K_2SO_4	1.686	3.264	.594
$CaSO_4$	3.470	2.159	3.986
$CaCO_3$	1.448	2.950	.275
MgO	5.128	1.959	6.457
$MgCl_2$	1.840	3.848	—
$Mg_2P_2O_7$	.444	1.709	0.236
Fe_2O_3	.081	traces	.029
CuO	.085	0.297	0.508
P_2O_5	—	—	—
SO_3	—	—	—
Cl	—	—	—
SiO_2	—	—	—

BLOOD OF LIMULUS (MCGUIGAN).
Summary of results.

	Per Cent.
Water	91.784
Solids:	
Proteid	5.162
Ash	2.676
Other organic constituents	.378
	8.216

[1] Von Furth, 'Vergleichende Chemische Physiologie der niederen Tiere,' 1903, p. 88.

Ash.

Cl (total)	54.820
NaCl	28.600
KCl	2.930
CaO	2.510
MgO	5.580
P_2O_5	0.340
Fe_2O_3 (not determined)	trace
CuO	0.273
SO_3	1.570
SiO_2	.420
Cl (uncombined with K and Na)	3.281
CO_2	not determined

Although the results agree fairly well, yet there are differences. Whether or not these differences are sufficient to cause an appreciable change in the metabolism of the ganglion cells as evidenced by the behavior of the heart muscle remains to be investigated. Any change in the metabolism of the ganglion cells would be more stimulating if the changes in the composition of the plasma were sufficiently rapid to prevent the acclimatization of the colloids. However, as the sea water itself varies in composition in different localities, in order to get a close agreement in the blood ash, it may be necessary to select animals from the same locality. The ash which I examined was prepared at the Marine Biological Laboratory, Woods Hole, Mass. The proteid and moisture content were determined immediately after the removal of the Limulus from the water. Before any definite conclusions can be drawn from this work it may be necessary to make more analyses.

HUGH MCGUIGAN
WASHINGTON UNIVERSITY

QUOTATIONS

THE GREAT MEN OF FRANCE

THE word *plébiscite* has been for more than thirty years a word of ill-omen in France. One of the most widely circulated of French newspapers, the *Petit Parisien,* has, however, been rehabilitating the word during the last few weeks in a way too striking to be ignored. It appealed to its readers all over the country to vote on the question of the relative preeminence of great Frenchmen of the last century. Fifteen million answers have been re-

ceived, and what gives value to this striking demonstration is that we have here the opinion of average France, not that of a political *coterie* or of a cultivated *élite*. The world knows now approximately what France thinks of her great men and what her conception is of civic duty, as well as of intellectual and moral distinction. It is the revelation to the foreigner of an idealism certainly unsuspected. Only those observers who have had the privilege of studying the evolution of the French mind and feeling over an unbroken series of years on the spot were aware of the profound transformation which the Republican school system and stable Republican government in general have affected in the points of view of the present generation of Frenchmen.

The winner of the recent contest is Pasteur. Victor Hugo runs him close, having received 1,227,103 votes against 1,338,425 for the world-renowned man of science. But it is characteristic that two men of peaceful pursuits should precede on the list those great Frenchmen who might have appeared at first sight to have most contributed to that special kind of glory known as French. Gambetta follows Victor Hugo with 1,155,672 votes. Then come Napoleon I. and Thiers with 1,118,034 and 1,039,453 votes, respectively. For the sixth place what foreigner would have suggested the name of Lazare Carnot? Yet a moment's reflection will reveal the reasons for his juxaposition with Thiers. The latter has certainly been acclaimed as the 'libérateur du territoire,' and what, after all, was that work of his but the repetition of the incomparable services rendered by Carnot in the organization of the Republican armies of the Revolution? With remarkable persistency, moreover, the French soul to-day vibrates between the primordial patriotic concern as to the defence of the integrity of French soil and its emotion of gratitude in presence of the great peaceful benefactors of the nation in the fields either of science or of art. The order of the names that succeed Lazare Carnot's is the proof of this statement—Curie, the discoverer of radium; Alexandre Dumas *père*, who has charmed several generations not only of Frenchmen, but also of Englishmen; Dr. Roux, the inventor of the diphtheritic serum; Parmentier, the introducer of the potato into France; then Ampère, the father of dynamic electricity; Brazza, the founder of French West Africa; Zola, whose place here thirteenth on the list shows conclusively what France now thinks of his courageous deed as author of 'J'accuse'; Lamartine, a consoling election for those who have always regarded the author of 'The Lake' as the most seductive Frenchman of the nineteenth century; and François Arago, the astronomer and physicist.

This brings us to the sixteenth place, which is held gloriously by Mme. Sarah Bernhardt. But immediately afterwards comes M. Waldeck-Rousseau, MacMahon, the hero of the famous "J'y suis, j'y reste"; President Carnot, who certainly incarnates here a very characteristic conception of civic duty; Chevreul, the chemist; and Chateaubriand, the most eloquently French of all the writers of the last century, unless exception be made for Michelet, who figures twenty-third on this list after de Lesseps. This is a victory which shows how short-lived is French rancour. Ten years ago no *plébiscite* in France would have given such a result, the stupendous energy of the creator of the Suez Canal having been forgotten amid the tempest of the Panama scandals. The next four names are Jacquard, the inventor of the weaving machine, Jules Verne, President Loubet, and Denfert-Rochereau. The list is to be continued until we have before us 502 names. These results constitute a lesson full of instruction not only for the rulers of France, but for foreigners curious as to the temperament and ideals of contemporary Frenchmen.—Paris correspondent of the London *Times*.

CURRENT NOTES ON LAND FORMS

In taking up again the series of 'Current Notes on Physiography,' begun in 1895 in the first of the New Series volumes of Science, the senior reviewer has as associates Professor D. W. Johnson, of Harvard, and Mr. Isaiah Bowman, of Yale. The term physiography was taken, at the beginning of the series twelve years ago, to be the modern equivalent of what has long been known as physical

geography, and hence to include a consideration of air and oceans as well as of lands; but as notes on meteorology and oceanography were later handed over to other contributors, and as the attention of the writer of this series of notes came to be more exclusively directed to the forms of the lands, it was found that some readers interpreted physiography as meaning the study of land forms only. To avoid this misconception, the notes now offered are placed under an unequivocal title, for which some writers have suggested the single-word name, geomorphology or geomorphy. However named, the topic here treated is to be regarded only as a large division of physiography, and not as the whole content of that subject. W. M. DAVIS

WESTLAND, NEW ZEALAND

THE chief physiographic features of Westland, a province of the southern island of New Zealand, as described by J. M. Bell ('Geology of the Hokitika Sheet,' Bull. No. 1, N. S., N. Z. Geol. Survey, Wellington, 1906), are: An interior alpine chain, trending northeast, flanked on the west by an uplifted and dissected peneplain, and this followed by a coastal plain, which is interrupted near its inner border by outliers of the dissected peneplain and trimmed along the coast by the sea. The structure of the mountains is synclinal in the main; the highest peaks, 6,000 or 7,000 feet, are of grauwacke or sandstone. The snowfields on the higher slopes and the glaciers which descend into all the higher valleys are much reduced from their quaternary extension. With one exception, the streams issuing from the glaciers do not carry rock flour; this, it is thought, marks the inefficiency of the present comparatively weak glaciers in eroding the rocky beds of their more powerful predecessors.

The present altitude of the flanking peneplain (Wainihinihi) suggests that the alpine chain as well as the peneplain owes its altitude to modern massive uplift, as has been found to be true in so many other ranges. The range is therefore only the less consumed part of an ancient mountain system, of which the peneplain is the more consumed part. This idea is confirmed by the occurrence of occasional elevations which surmount the uplands of the dissected peneplain. The dissection of the uplands has progressed so far in the neighborhood of the principal rivers that the isolated mountainous fragments receive distinctive names. The sides of the larger valleys have been smoothed by glacial action, and in many cases the normal preglacial spurs have been truncated. Cirques in the valley heads, hanging lateral valleys along the main valley courses, and roches moutonnées in the valley floors are frequently seen. The coastal plain, fronting the Tasman sea, is of complex form. In its first cycle a series of marine gravels and clays were elevated and dissected: the dissected plain was then submerged, partly buried under new sediments, and elevated for renewed dissection, with the higher remnants of the earlier plain rising through the surface of the newer one. The present cycle of dissection has been complicated by glaciation. The greatest width of the plain is about fifteen miles, and the elevation of its inner border is 600 feet. I. B.

RIVER TERRACES IN VERMONT

THE theory elaborated by Davis some years ago in regard to the origin of river terraces has been tested by E. F. Fisher, who has applied it to the explanation of the terraces found along West River in Vermont, near its junction with the Connecticut. This theory, as stated by Fisher, is that "the river terraces of New England may be accounted for by the behavior of meandering and swinging streams slowly degrading previously aggraded valleys without necessary change in volume, and by the control exerted here and there over the lateral swinging of the streams through the discovery of rock ledges." It is found that this theory alone is adequate to account for the features noted in the region studied.

Professor Fisher presents the results of her studies in a paper entitled 'Terraces of the West River, Brattleboro, Vermont' (*Proc. Bost. Soc. Nat. Hist.*, XXXIII., 1906, pp. 9–42). The lateral swinging of rivers by meanders, cut-offs and short cuts is considered, and the evidence in favor of a fourth process

presented. This latter, called the 'partition process,' occurs when for any reason the swiftest current of a stream is withdrawn from a bank of erosion, with the resulting formation of a sandbar or island not continuous with the eroded bank, and therefore parting the stream. The deeper channel eventually acquires the entire stream, the deserted channel and former island are added to the floodplain, and the stream has thus moved laterally a certain distance.

It is shown that West River, swinging laterally by the various processes just noted, and at the same time slowly degrading its previously aggraded valley, has in its downcutting discovered numerous rock ledges, which have exerted a distinct control upon the extent and character of the lateral swinging, and hence upon the erosion which has produced the terraces. The paper is abundantly illustrated by diagrams and plates as well as by maps and sections based on original surveys, and furnishes an important contribution to the theory that river terraces are not necessarily connected with change in stream volume, or with successive uplifts of the region involved. D. W. J.

FAULT BLOCKS IN THE SIERRA NEVADA

'The Geomorphic Features of the Middle Kern,' by A. C. Lawson (*Bull. Dept. Geol. Univ. Cal.*, IV., 1906, 397–409), deals with a district of subrecent faulting in the southern Sierra Nevada of California. The case appears to be as follows: A great mountain mass, hereabouts reduced to moderate relief, though hardly smooth enough to deserve the name of peneplain, was raised in the huge fault block of the Sierra Nevada, with a gentle descent to the west; it was subsequently more or less dissected. A local fault in the southern part of the mass, bearing north-northeast, with relative uplift on the west and depression on the east, broke the general westward descent of the range and therefore disturbed the westward flow of the rivers, deflecting some of them to new courses along the fault line, and causing all to aggrade their valleys as they approach the escarpment of the uplift. Breckenbridge mountain is the name given to the uplifted and now dissected block, west of the fault line; Walker, Havilah and Hot Springs valleys are aggraded basins lying at the base of the maturely dissected fault scarp. The basins are separated by 'spurs' which come down from the mountains on the east; the spurs appear to be either residual reliefs of pre-faulting form (modified by subsequent erosion), or indications of inequality of faulting, or both. Breckenbridge mountain is described as "an asymmetrical ridge * * * its western slope is exceedingly gentle and descends uniformly towards the great valley [of California]. * * * Its eastern side is a very precipitous mountain front. * * * The mere inspection of the profile suggests immediately that the mountain is a tilted orographic block and that its eastern front is a fault scarp." This vivid description seems to underrate the part played by erosion; for the front of the block as shown in a photograph slopes only about 25°, and is much scored by large ravines. It would, therefore, seem better to describe the front as 'determined by a fault scarp originally, but now much battered and dissected.' It was the neglect of such specific statement of the work of erosion on the fault-block ranges of the Great Basin that contributed to the misunderstanding of their origin by some observers.

'The Geomorphogeny of the Tehachapi Valley System' is another paper by the same author (*ibid.*, 431–462) on a similar problem of greater area and complication. It is of special value because it considers in some detail the pre-faulting topography of its district—a point that has been too generally neglected in studies of this kind.

W. M. D.

TECHNIQUE OF PHYSIOGRAPHIC DESCRIPTIONS

It is a matter of common experience to find difficulty in the appreciation of an article, such as the one outlined in the foregoing note, in which various physiographic features are located with respect to villages like Kernville, Havilah and Vaughn, without the aid of even an outline map. Unimportant villages, presumably unknown outside of their own state—and probably not known all through so large a state as California—have no guiding value to

most readers; though in the end there is a satisfaction in knowing that Havilah, for example, appears to owe its opportunity in a mountainous district to the flat floor of an aggraded valley, whose stream was there turned from a previous course down the general slope of the Sierra Nevada into a northward path along the base of a fault-block scarp, and hence is now to be regarded as consequent upon the faulting. Again, it is often the case that a reader must follow through the inductive presentation of a more or less intricate problem—if he does not turn at once to the end of the article in the hope of seeing there a summary which tells him concisely what the writer is driving at—and thus finds himself in the necessity of carrying many items in mind before he knows the conclusion on which they bear. Indeed an inductive presentation, appropriate enough for beginners who have little acquaintance with generalities, may give too much importance to the author's personal experience when employed in articles that are designed for mature readers, already informed as to generalities.

As an alternative by which both of these difficulties may be in large measure avoided, it is worth while to consider a method which has some likeness to one that we all know in geometry, where the theorem is stated at the beginning, in order that all the items of the demonstration may be at once appreciated in their bearing on the end thus placed in view. When applied to physiographic descriptions, this method would require the presentation of the explanatory conclusion at the outset. The conclusion would there be stated, independently of local names, in terms of a systematic general nomenclature, from which the reader could easily build up a mental picture of the larger features of the district concerned; for the systematic nomenclature, already familiar from previous study, would easily bring known forms to mind. Details could then be added at their appropriate positions in the larger masses; and as the description thus proceeded, more and more warrant would be found for the conclusion that had been stated in the first place. Villages and roads, hardly known outside of their immediate districts, would be located as occasion offered with respect to the larger masses and their details, instead of *vice versa*. Even if an outline map is added to indicate route and local names, a separate figure, giving in a general way the graphic equivalent of the general conclusions, is of much service; for the route followed by the observer is a relatively subjective detail, and the local names too often only distract from the main description. It is chiefly through the general features that the distant reader can reach the smaller items.

This method might work injury where the conclusion remains in doubt; for the presentation of a doubtful conclusion at the beginning of an article would probably give it too high rank. The method might be inconvenient in cases where most readers of an article were on the ground, and therefore already familiar with local names. But in such a case as the one treated in the article reviewed above, the conclusion is surely safe enough to deserve presentation in systematic terminology in an opening statement; and the local readers are probably only a small minority of the many far-away students who will profit from Lawson's excellent work. W. M. D.

REPORT OF THE GEOLOGICAL EXPEDITION OF HON. CHARLES H. MORRILL. SEASON OF 1906

THE MORRILL geological expedition of the University of Nebraska for the season of 1906 continued the work of the previous season by developing the bone quarry on University Hill, at Agate, Sioux County, Nebraska. This quarry is situated on the eastern extremity of Mr. James Cook's ranch, which is an extensive one, and probably the best known in the state. In addition to the uplands it contains some ten square miles along the valley of the Niobrara. The high bluffs adjacent to and beyond this model ranch are fossiliferous, while at Carnegie Hill and University Hill there are literal bone beds. The discovery of these beds was made some twenty years ago by Mr. James Cook. They were first visited by the Morrill geological expedition of 1892, when a considerable number of bones were collected, several of which have

been figured in the 'University Studies,' January, 1897, plate 1, Figs. 5, 6, 7.

Pursuant to invitations from Mr. Cook, the Morrill geological expedition of 1905 spent that summer developing the bone quarry on University Hill. During the summers of 1905 and 1906 the members of the exploring party enjoyed all the privileges and hospitalities of this famous ranch. The members of the party for 1906 were: Harold J. Cook, Eck F. Schramm, Edwin Davis and Paul Butler, students in the University of Nebraska. As in former expeditions the writer was in charge.

By the judicious use of dynamite large amounts of overlying rock were removed and a broad surface of the bone-bearing layer exposed. A large number of bones, jaws and skulls were secured, all being for the most part in a fine state of preservation.

The prize specimens of the season were two large slabs cut from the bone-bearing layer and shipped bodily. They are literally packed with bones and jaws, which will be worked out but not removed from their original position. When done they will be placed on exhibition intact, to illustrate fossil bone beds. The bones of *Moropus* and *Diceratherium* are so abundant in this quarry that they far outnumber all else. Of the rare *Moropus* the Morrill collections now have enough material for a complete restoration. There was found to be considerable variation in the size of *Moropus* bones, some being of elephantine size. Of *Diceratherium* a great number of bones and jaws, but no good skulls were secured.

In August the writer, accompanied by Mr. Harold Cook, spent ten days exploring and collecting relics in and around the 'Spanish Diggings' west of the Rawhide range in Wyoming, where among other things over a thousand stone implements were procured. A few weeks later the writer again visited this spot in company with Dr. M. H. Everett and Edwin Davis at the invitation of Mr. Thomas Black of Willow, Wyo., who not only entertained the expedition in a most hospitable manner but provided teams and conveyance. A wide area was explored and many specimens and implements added to the previous lot. Later a third trip was made to this region by Dr. Everett, who secured additional specimens and data of value. A mild fall, free from the hindrances of rain and snow, has made the continuance of field work possible to the present date. Several days were spent by the writer, accompanied by Dr. George E. Condra, Edwin Davis and Paul Butler, excavating the mound recently discovered by Mr. Robert F. Gilder of Omaha, many human remains of a primitive order being secured. Among miscellaneous acquisitions of the year may be mentioned the skeletons of four modern elephants, camels, bear, etc., secured early in the season by Mr. Henry Eakin.

The Morrill collections will be moved into their new fire-proof quarters the latter part of December, and more than one hundred tons of material now boxed and stored in the basements of various buildings and the steam tunnels on the campus will be placed on exhibition. The benefactions of Hon. Charles H. Morrill make these expeditions possible, and it is planned to greatly increase their extent and scope each year.

Erwin H. Barbour
The University of Nebraska,
December 6, 1906

THE NATIONAL GEOGRAPHIC SOCIETY

Addresses have been arranged as follows:

January 18.—'Camping Expeditions in the Canadian Rockies,' by Mr. Howard Du Bois.

January 25—'Bolivia—a Country without a Debt,' by the Bolivian Minister, Señor F. Calderon. Illustrated.

February 1—'The Rising Pacific Empire,' by Hon. George C. Perkins, U. S. Senator from California.

February 8—'The Guianas,' by Prof. Angelo Heilprin, of Yale University. Illustrated.

February 15—'Ten Years of Polar Work; or, What We Know and What We Want to Know,' by Mr. Herbert L. Bridgman, Secretary of the Peary Arctic Club. Illustrated.

February 19—'Two Thousand Miles in the Saddle through Colombia and Ecuador,' by Hon. John Barrett, U. S. Minister to Colombia. Illustrated.

March 1—'Santo Domingo and Haiti,' by Rear Admiral Chester, U. S. Navy. Illustrated.

March 15—'The Regeneration of Korea,' by Mr. George Kennan. Illustrated.

March 21—'Our Immigrants: Where They Come From, Wnat They Are, and What They Do After They Get Here,' by Hon. F. P. Sargent, Commissioner General of Immigration. Illustrated.

March 23—'Queer Methods of Travel in Curious Corners of the World,' by Hon. O. P. Austin, Chief Bureau of Statistics. Illustrated.

March 29—'Mexico—the Treasure-house of the World,' by Mr. N. H. Darton, of the U. S. Geological Survey. Illustrated.

April 5—'A Popular Explanation of Earthquakes and Volcanoes,' by Dr. G. K. Gilbert, of the U. S. Geological Survey. Illustrated.

April 12—'Captain John Smith and Old Jamestown,' by Mr. W. W. Ellsworth, Secretary of the Century Co.

Announcements will be made later of addresses by Commander Robert E. Peary, U. S. Navy, who has recently attained 'Farthest North,' and by Dr. F. A. Cook, of Brooklyn, who has accomplished the first ascent of Mount McKinley, the highest mountain in North America.

Scientific meetings will be held at the home of the society, Hubbard Memorial Hall, Sixteenth and M Streets, at 8 P.M., on the following dates:

January 11—Annual Meeting. 'Aboriginal Agriculture in Guatemala,' by Mr. O. F. Cook, of the U. S. Department of Agriculture. Illustrated.

January 16—'The U. S. Forest Service,' by Mr. Gifford Pinchot, Forester. Illustrated. The Forest Service has charge of 114,606,058 acres of forest land, worth $400,000,000.

January 22—'The Coal Lands of the U. S. Public Domain,' by Mr. M. R. Campbell, of the U. S. Geological Survey. Illustrated.

February 9—'A Visit to Sumatra,' by Mr. George H. Peters, of the U. S. Naval Observatory. Illustrated.

February 18—'Reclaiming the Desert,' by Mr. C. J. Blanchard, of the U. S. Reclamation Service. Illustrated. The Reclamation Service has a fund of $40,000,000, which is being invested in irrigation works.

February 22—'Reclaiming the Swamp Lands of the United States,' by Mr. H. M. Wilson, of the U. S. Geological Survey. Illustrated.

March 8—'Twenty Years in Beirut and Damascus; or, The Syria of Today,' by Rev. F. E. Hoskins. Illustrated.

March 22—'Utilizing the Surface Waters of the United States for Power,' by Mr. H. A. Pressey, C. E. Illustrated.

April 6—'The South Sea Islanders,' by Mr. A. B. Alexander, of the U. S. Bureau of Fisheries. Illustrated.

April 15—'Photographs of Wild Game taken by Themselves,' by Hon. George Shiras, 3d. Illustrated.

April 19—'A Trip to Argentine and Paraguay,' by Mr. John W. Titcomb, of the U. S. Bureau of Fisheries. Illustrated.

MEDICAL LECTURES AT THE HARVARD MEDICAL SCHOOL

THE faculty of the Harvard Medical School has arranged a course of free public lectures, to be given at the new Medical School buildings, Longwood Avenue, Saturday evenings and Sunday afternoons, beginning January 12, 1907, and ending May 12. Following is a list of the lecturers and their subjects, with dates:

January 12—'Unfavorable Conditions of Modern School Life,' by Dr. Robert W. Lovett.

January 13—'Deformities of the Feet from Shoes,' by Dr. Edward H. Bradford.

January 19—'Round Shoulders and Lateral Curvature,' by Dr. Robert W. Lovett.

January 20—'Costume Deformities in Growing Children,' by Dr. Edward H. Bradford.

January 26—'Bacteria in Health and Disease,' by Dr. Harold C. Ernst.

January 27—'Public Milk Supplies,' by Dr. Charles Harrington.

February 2—'Under What Circumstances should you send for the Doctor,' by Dr. George W. Gay.

February 3—'The Adulteration of Food and Drugs,' by Dr. Charles Harrington.

February 9—'Bacteria in Health and Disease' (No. 2), Dr. Harold E. Ernst.

February 10—'How the Common Infectious Diseases are Spread,' by Dr. George B. Magrath.

February 16—'The Care of the Sick Room,' by Dr. Elbridge G. Cutler.

February 17—'Public and Individual Water Supplies,' by Dr. Charles Harrington.

February 23—'Antitoxins and Vaccines,' by Dr. Theobald Smith.

February 24—'What Surgery can and cannot do,' by Dr. Maurice H. Richardson.

March 2—'The Present Epizoötic of Rabies,' by Dr. Langdon Frothingham.

March 3—'Disease,' by Dr. William T. Councilman.

March 9—'The Hygiene of the Ear,' by Dr. Clarence J. Blake.

March 10—'Disease' (No. 2), by Dr. William T. Councilman.

March 16—'Facts about Rheumatism,' by Dr. Joel E. Goldthwait.

March 17—'Care of Healthy Infants and Prevention of Disease in Early Life,' by Dr. Thomas Morgan Rotch.

March 23—'Some Points concerning Nursing in Scarlet Fever and Measles,' by Dr. John Hildreth McCollom.

March 24—'Tuberculosis in Early Life,' by Dr. John Lovett Morse.

March 30—'Some Facts the Public should know concerning the Feeding of Infants,' by Dr. Maynard Ladd.

March 31—'Significance, in Infancy and Early Life, of Disturbances of the Stomach and Bowels,' by Dr. Charles Hunter Dunn.

April 6—'Some Phases of the Tuberculosis Problem,' by Dr. Arthur K. Stone.

April 7—'Tuberculosis: Methods of Invasion and Dissemination,' by Dr. Theobald Smith.

April 13—'Pulmonary Tuberculosis,' by Dr. Harold C. Ernst.

April 4—'Eyesight and School Life,' by Dr. Miles Standish.

April 20—'Florence Nightingale and the Beginning of Surgical Nursing,' by Dr. J. Babst Blake.

April 21—'Food in Health and Disease,' by Dr. Franklin W. White.

April 27—'The Growth of Children,' by Dr. William T. Porter.

April 28—'Food in Health and Disease' (No. 2), by Dr. Franklin W. White.

May 4—'History of the Treatment of Disease,' by Dr. Maurice V. Tyrode.

May 5—'The Care of the Sick,' by Dr. John T. Bowen.

May 11—'The Hygiene of the Mouth and Teeth,' by Dr. Samuel A. Hopkins.

May 12—'The Physical and Mental Development of Children,' by Dr. James S. Stone.

THE U. S. GEOLOGICAL SURVEY

The annual report of the director of the Geological Survey for the fiscal year 1905–6 states that all work formerly carried on by the survey in the classification and mapping of forest lands other than topographic maps was transferred to the Bureau of Forestry prior to July 1, 1906. The making of the topographic maps of the reserves which are part of the area covered by the general topographic map of the United States will be continued by the survey, and the maps will be available for engineers, geologists, etc.

The report also contains the interesting information that the great Reclamation (Irrigation) Service was severed from the Geological Survey on July 1, 1906, except that the director of the survey continued to act as director of that service. The report further states that it is probable that an entire separation will occur at an early date, and we learn informally that all connection will be terminated between the two organizations before the close of the present fiscal year. Public policy demanded that the Reclamation Service should be organized under some strong existing bureau. This was done, and the service, now well organized, will soon be made an independent bureau.

Eighty-one members of fifty-one educational institutions in the United States were connected with the work of the survey in 1906, and over $200,000 was expended in this cooperative work.

The amount of work done for the survey by men connected with universities, colleges and technical schools was not proportionately as large as in the first decade of the existence of the survey (1880–90), a condition explained by the fact that it is the men who have been trained at the universities, colleges and technical schools who are now members of the permanent staff of the survey.

The publications of the survey are distributed without cost to 426 educational institutions in the United States. Of this number 120 received the maps, folios and topographic sheets.

SCIENTIFIC NOTES AND NEWS

During the presence in New York City of Dr. William H. Welch, professor of pathology at the Johns Hopkins University, to preside over the meeting of the American Association for the Advancement of Science, a testimonial

dinner was tendered to him by fifty of his 'scientific friends and admirers in Greater New York.'

IT appears from the Year Book of the Carnegie Institution that Dr. William H. Welch, Dr. Henry S. Pritchett and the Hon. William H. Taft have been elected trustees. Mr. William Wirt Howe and the Hon. Wayne MacVeagh have resigned from the board. Dr. John S. Billings was re-elected chairman, the Hon. Elihu Root, vice-chairman, and Mr. Cleveland H. Dodge, secretary for three years. Appropriations for the ensuing year were made as follows:

Publication fund, to be continuously available	$70,000
Administration	50,000
Grants for departments and large projects	443,200
Grants for previously implied investigations, new minor investigations, and research associates and assistants	98,100
Total	$661,300

AT the annual banquet of the National Geographic Society the first award of its gold medal was made to Commander Peary.

THE international cup balloon race will be held at St. Louis on October 19. It is also announced that an aeronautic congress has been arranged in connection with the Jamestown exposition with Dr. Alexander Graham Bell as president.

DR. WILLIAM DUANE, professor of physics in the University of Colorado, at Boulder, has resigned to accept a position in the Curie Radium Laboratory at Paris. The fund providing for Dr. Duane's work is the gift of Mr. Andrew Carnegie.

DR. W. W. KEEN has been made professor emeritus of surgery in the Jefferson Medical College, Philadelphia, and expects to spend a year abroad. Dr. Keen will celebrate his seventieth birthday on January 19.

THERE was recently given at the Chemists' Club, New York City, a dinner to celebrate the twenty-fifth anniversary of the receipt of the doctorate of the University of Würzburg by Dr. William Hallock, professor of physics at Columbia University and dean of the faculty of pure science.

DR. BASHFORD DEAN, professor of vertebrate zoology in Columbia University and honorary curator of fishes in the American Museum of Natural History, has been elected president of the Society of Vertebrate Paleontologists.

AT the recent meeting of the American Economic Association, Professor J. W. Jenks, of Cornell University, was elected president.

DR. E. W. BENECKE, professor of geology at Strasburg, and Dr. A. von Koenen, professor of geology at Göttingen, have retired from active service.

FRITZ ZERBAN, Ph.D. (Munich), has succeeded to the place of Dr. C. A. Browne, Jr., as chemist at the Louisiana sugar station.

MR. J. B. MOWRY has been appointed commissioner of forestry in Rhode Island.

A RUSSIAN expedition for the exploration of the Arctic regions is being equipped under the leadership of Lieutenant-Colonel Sergeyeff. The expedition, which will last for several years, will start from Yeniseisk and try to reach Bering Strait.

DR. RITZ ROMER has been appointed director of the Museum of the Senckenberg Natural History Society of Frankfort.

PROFESSOR F. CAVARA has been appointed director of the Botanical Garden at Naples.

DR. H. R. MILL has been elected an honorary member of the Vienna Geographical Society.

THE sixth lecture in the Harvey Society course will be delivered by Professor Francis G. Benedict, of Wesleyan University, on January 12, at 8:30 P.M., at the New York Academy of Medicine. Subject: 'Metabolism during fasting.' The celebrated professional faster, Succi, who has been the subject of many classical experiments on metabolism, will be present.

MISS CLARA EATON CUMMINGS, Hunnewell professor of cryptogamic botany in Wellesley College, died in Concord, N. H., on December 28. Professor Cummings had been long identified with the history of the college. Entering as a student in 1876, a year after the first opening, she at once showed so marked a talent for the study of botany, especially for the identification of cryptogamic flora, that she was retained as a permanent member of that

department, bearing the title of curator of museum from 1878 to 1879, and that of instructor of botany from 1879 to 1886. After a period of study in Zürich, Miss Cummings returned to the college as associate professor of cryptogamic botany. In 1905 she became Hunnewell professor of botany, with temporary charge of the department. In 1906 her title was changed to that of Hunnewell professor of cryptogamic botany, in recognition of the closely specialized work in which she had reached distinction.

THE death is announced, at the age of sixty-eight years, of Mr. Jeremiah Curtin, known for his works on anthropology and travel and to the general public for his translations of the novels of Henryk Sienkiewicz.

MR. JOHN WARD, a well-known Staffordshire geologist, fellow of the Geological Society of Great Britain since 1874, has died at the age of seventy.

DR. ARTHUR WILLIAM PANTON, fellow of Trinity College, Dublin, well known as a teacher of mathematics and a writer on this subject, died on December 18, at the age of about sixty years.

DR. THAER, formerly professor of agriculture at Giessen, died on December 14, at the age of eighty-seven years.

DR. OCHSENIUS, a geologist at Marburg, has died at the age of seventy-seven years.

THE deaths are also announced of Dr. K. O. Harz, professor of botany and pharmacology in the Veterinary Institute at Munich, and of Dr. Antonio Mascari, assistant in the observatory at Catania.

THE U. S. Civil Service Commission announces an examination on February 6–7, 1907, to fill a vacancy in the position of scientific assistant in plant pathology, $1,000 per annum, Bureau of Plant Industry; a vacancy in the position of scientific assistant in animal bacteriology, $840 per annum, Bureau of Chemistry; and vacancies as they may occur in the Department of Agriculture requiring similar qualifications.

IT is expected that the National Education Association will hold its fiftieth anniversary in Philadelphia, where it was organized in 1858. The department of superintendence of the National Education Association will meet in Chicago on February 26, 27 and 28. With it will meet the National Society for the Scientific Study of Education, the Society of College Teachers and the Educational Press Association of America.

A MEETING was held on January 2 at the physiological building of the Johns Hopkins Medical School for the formal presentation and acceptance of two noteworthy collections of medical works given to the library by Mr. W. A. Marburg and Mr. Francis M. Jencks. The works given by Mr. Marburg are the old Warrington Dispensary Library of Liverpool, which is particularly valuable in the history of medicine. The library consists of about 944 volumes. The collection given by Mr. Jencks consists of 936 volumes, and is the Friedrich Ahlfelb library, of Marburg, Germany. It is a specialized library, consisting of writings on 'monsters.' Dr. Ira Remsen, president of the university, presided, and addresses were made by Dr. William Osler, regius professor of medicine at Oxford, and by Dr. William H. Welch.

MR. ANDREW CARNEGIE has given $750,000 for the construction of a building to be used by the Bureau of American Republics. Provision for the site already has been made by the United States and the South American republics.

AT a special general meeting of the Royal Society of Edinburgh, held on December 21, the council presented a report on the new accommodation to be provided for the society in consequence of its proposed removal from the Royal Institution. It appears from this report, as quoted in *Nature*, that in March last a memorial was presented to the secretary for Scotland directing attention to the needs of the society, and asking for a free grant of £600 a year. In a semi-official reply to this memorial the general secretary of the society was informed that a proposal was being entertained by the government to devote the whole of the Royal Institution to the purposes of art, and that the Royal Society must con-

template the necessity for finding accommodation elsewhere. At it appeared from correspondence and an interview with the secretary for Scotland that the government had definitely decided to allot the whole of the Royal Institution for the purposes of art, the council resolved, with great reluctance, to accept the necessity for removal, and to do its best to secure adequate reinstatement. An accommodation committee was, therefore, appointed by the society to advise the secretary for Scotland regarding sites and buildings suitable for new premises for the society with the result that the committee unanimously recommended the building at present occupied by the Edinburgh Life Insurance Office, Nos. 22 and 24 George Street. At an interview on November 22 Mr. Sinclair offered, subject to the consent of Parliament, to purchase and adapt the George Street building on certain conditions, and in addition to give a free grant for the scientific purposes of the society. The conditions proposed were approved by the representatives of the society present as being, in the circumstances, an equitable settlement of the claims of the society. The arrangements are that a sum of £25,000 will be used for the purchase of a building, and £3,000 to cover the expenses of fitting up, redecorating the new premises, and transferring the library and other effects of the society from the Royal Institution. The treasury will also give the society a grant of not more than £600 a year.

AT the last monthly general meeting of the Zoological Society, of London, Mr. Howard Saunders, F.L.S., vice-president, in the chair, 103 candidates were elected fellows. The report of the council for November was read by the secretary, Dr. P. Chalmers Mitchell, F.R.S. This stated that 173 additions had been made to the society's menagerie during that month—viz., 105 acquired by presentation, 23 by purchase, 35 received on deposit, three received in exchange, and seven born in the gardens. Amongst these special attention was directed to an adult male mandrill (*Papio maimou*), the first full-sized example of this species exhibited in the gardens, deposited on November 30; to a young female hippopotamus (*Hippopotamus amphibius*) from the Niger, purchased on November 1; to a Persian stag (*Cervus maral*), presented by Mr. Carl Hagenbeck on November 13; to a Kashmir stag (*Cervus cashmiriensis*), presented by the Duke of Bedford on November 22; and to a collection of 47 birds containing, amongst other interesting specimens, a green toucan (*Aulacorhamphus sulcatus*), new to the collection, and a sun bittern (*Eurypyga helias*) from Venezuela, presented by Captain Albert Pam, F.Z.S., on November 27. The report further stated that the number of visitors to the society's gardens during the month of November had been 22,025. The total number of visitors to the gardens during the year amounted to 881,018, showing an increase of 185,055 as compared with the corresponding period of the previous year.

WE learn from *The British Medical Journal* that in addition to the Johnston Laboratories, the Liverpool School of Tropical Medicine is possessed of Research Laboratories at Runcorn, established some two years ago, because the Johnston Laboratories, although perfect for the purposes for which they were built, did not, being situated in a city, lend themselves well to researches demanding the keeping of a large number of animals, both great and small. Crofton Lodge at Runcorn, some sixteen miles distant, was therefore taken, some of its rooms converted into research rooms and ample stabling and pasture for all sorts of animals secured on a small adjoining farm. For the first year the chief energies of the newly-founded laboratories were devoted to the study of various forms of trypanosomiasis, but since September, 1905, the work has been mainly concerned with the spirochætes of relapsing fever. Research work proper is, however, only part of the function of these laboratories, another being the important task of keeping the Johnston Laboratories supplied with living parasites, for the instruction of the students of the School of Tropical Medicine. To this end, therefore, the trypanosomes of dourine, mal de Caderas, nagana, Gambian horse sickness and 'sleeping sickness' are kept constantly going in animals. Similarly, the spirochætes of 'relapsing fever,' and of mice (*Spirochæta laverani*), of 'African tick-

fever,' and of fowls, are kept for the same purposes. The ticks, *Ornithodoros moubara* and *Argas miniatus,* which transmit the two last-named diseases, are likewise bred in the laboratories, and stocks of the *Irodes reduvius* and *Rhipicephalus annulatus,* those transmitting the piroplasms of 'red water' in cattle, kept. The equipment of the laboratories is not elaborate or showy, but everything is available which is required to permit full advantage to be taken of the material at disposal. The present director is Dr. J. L. Todd, who during the past twelve months has had some dozen research students working with him.

UNIVERSITY AND EDUCATIONAL NEWS

Mr. John D. Rockefeller has given the University of Chicago $2,700,000 for its permanent endowment, and $217,000 for current expenses and special purposes. Among the special provisions of this latter gift are: To provide permanent increases in the salaries of instructors, $40,000; for additional cost of drinking water systems, $21,610; for the improvement of the campus, $15,000; for the Alice Freeman Palmer chimes, $5,000; for special equipment in various departments, $5,000; for greenhouses for the department of botany, $2,500. Mr. Rockefeller's gifts to the University of Chicago are said to amount to more than $20,000,000.

At the opening exercises of the new year President Warfield, of Lafayette College, announced that $325,000 had been subscribed toward the $500,000 endowment which is being raised to mark the seventy-fifth anniversary of Lafayette College. Of this sum Mr. Andrew Carnegie has given $50,000 for a mechanical engineering course. He will give an additional $50,000, provided the half million is secured.

A gift of $50,000 from Mr. Andrew Carnegie is announced by President George C. Chase, of Bates College. Mr. Carnegie's offer of this amount stipulated that friends of the institution should subscribe $100,000, and this amount has been secured.

The Chemical Library of Harvard University has recently received from the class of 1881 an addition of $1,500 to the $3,000 previously given, thus making a fund of $4,500, the income of which is to be used for the purchase of books.

We learn from the *Experiment Station Record* that plans are being perfected for a jubilee week next spring to celebrate the fiftieth anniversary of the opening of the Michigan College, the first agricultural college in the United States. It is now proposed to hold the jubilee on May 28–31. A program is being arranged so that the delegates to the Association of American Agricultural Colleges and Experiment Stations, which it is hoped will meet in Lansing at that time, may attend all the more important sessions of the jubilee. President Roosevelt will speak on May 31, and the college is planning to entertain from 10,000 to 15,000 people on that day.

The *Harvard Graduates Magazine* gives a classification of the students according to the divisions of the faculty of arts and sciences under which their studies chiefly lie. The predominance of the languages and humanities continues marked; only chemistry among the sciences shows a great growth in recent years. Semitic, none; ancient languages, 28; modern languages, 99; history and political science, 85; philosophy, 31; education, 21; fine arts, 5; music, 6; mathematics, 24; engineering, 5; forestry, 1; physics, 10; chemistry, 33; biology, 15 (botany, 2; zoology, 13); geology, 7; mining and metallurgy, 1; anthropology, 5.

Mr. R. C. Bryant, in charge of the cooperative work of the office of Forest Extension, of the Bureau of Forestry, has resigned to assist in organizing the work in connection with the chair of practical forestry and lumbering at the Yale Forest School.

There is a vacant instructorship in chemistry at Lehigh University, paying $1,000 annually. Applications should be sent to Professor W. B. Schober, South Bethlehem, Pa.

Professor A. Moller has been appointed director of the Forestry School at Eberswald.